[COMMITTEE PRINT]

ASTRONAUTS AND COSMONAUTS BIOGRAPHICAL AND STATISTICAL DATA

[Revised—June 30, 1989]

REPORT

PREPARED BY THE

CONGRESSIONAL RESEARCH SERVICE
LIBRARY OF CONGRESS

TRANSMITTED TO THE

COMMITTEE ON
SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

ONE HUNDRED FIRST CONGRESS

FIRST SESSION

Serial I

DECEMBER 1989

Printed for the use of the Committee on Science, Space, and Technology

U.S. GOVERNMENT PRINTING OFFICE
23-452 ⇆ WASHINGTON : 1989

H702-15

For sale by the Superintendent of Documents, Congressional Sales Office
U.S. Government Printing Office, Washington, DC 20402

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

ROBERT A. ROE, New Jersey, *Chairman*

GEORGE E. BROWN, Jr., California
JAMES H. SCHEUER, New York
MARILYN LLOYD, Tennessee
DOUG WALGREN, Pennsylvania
DAN GLICKMAN, Kansas
HAROLD L. VOLKMER, Missouri
HOWARD WOLPE, Michigan
BILL NELSON, Florida
RALPH M. HALL, Texas
DAVE McCURDY, Oklahoma
NORMAN Y. MINETA, California
TIM VALENTINE, North Carolina
ROBERT G. TORRICELLI, New Jersey
RICK BOUCHER, Virginia
TERRY L. BRUCE, Illinois
RICHARD H. STALLINGS, Idaho
JAMES A. TRAFICANT, Jr., Ohio
LEE H. HAMILTON, Indiana
HENRY J. NOWAK, New York
CARL C. PERKINS, Kentucky
TOM McMILLEN, Maryland
DAVID E. PRICE, North Carolina
DAVID R. NAGLE, Iowa
JIMMY HAYES, Louisiana
DAVID E. SKAGGS, Colorado
JERRY F. COSTELLO, Illinois
HARRY JOHNSTON, Florida
JOHN TANNER, Tennessee
GLEN BROWDER, Alabama

ROBERT S. WALKER, Pennsylvania*
F. JAMES SENSENBRENNER, Jr., Wisconsin
CLAUDINE SCHNEIDER, Rhode Island
SHERWOOD L. BOEHLERT, New York
TOM LEWIS, Florida
DON RITTER, Pennsylvania
SID MORRISON, Washington
RON PACKARD, California
ROBERT C. SMITH, New Hampshire
PAUL B. HENRY, Michigan
HARRIS W. FAWELL, Illinois
D. FRENCH SLAUGHTER, Jr., Virginia
LAMAR SMITH, Texas
JACK BUECHNER, Missouri
CONSTANCE A. MORELLA, Maryland
CHRISTOPHER SHAYS, Connecticut
DANA ROHRABACHER, California
STEVEN H. SCHIFF, New Mexico
TOM CAMPBELL, California

Harold P. Hanson, *Executive Director*
Robert C. Ketcham, *General Counsel*
Carolyn C. Greenfeld, *Chief Clerk*
David D. Clement, *Republican Chief of Staff*

---

*Ranking Republican Member.

LETTER OF TRANSMITTAL

House of Representatives,
Committee on Science, Space, and Technology,
Washington, DC.

To Members of the Committee on Science, Space, and Technology:

I am pleased to announce that the publication entitled "Astronauts and Cosmonauts Biographical and Statistical Data" has been updated by the Congressional Research Service.

For your information, Part I of this document describes all participants in the United States space missions. Part II details participants on Soviet missions, and Part III contains a series of comparative tables on U.S. and Soviet spaceflights.

The compilation of this material was a major undertaking for the Congressional Research Service. It is an excellent reference on U.S./Soviet space activities and I am pleased to forward it to you.

Sincerely,

Robert A. Roe,
Chairman.

LETTER OF SUBMITTAL

CONGRESSIONAL RESEARCH SERVICE,
THE LIBRARY OF CONGRESS,
Washington, DC, October 30, 1989.

Hon. ROBERT ROE,
Chairman, Committee on Science, Space, and Technology, House of Representatives, Washington, DC.

DEAR MR. CHAIRMAN: Pursuant to your letter of April 25, 1989, we are happy to transmit the attached revision of *Astronauts and Cosmonauts: Biographical and Statistical Data,* which updates events since the last edition was published in 1985. Data in this version cover activities through June 30, 1989.

The number of astronauts and cosmonauts in the world has grown strikingly as the years have passed, and the ability to know with certainty such information as marital status and number of children is increasingly difficult even for Americans (particularly those who have resigned from the NASA astronaut corps or who were never part of it); it is even more difficult for people from other countries. Thus, this book contains the best information we could obtain, but despite our efforts, a few records may be out of date. Also, some photographs of cosmonauts could not be reproduced because they were not available, or due to copyright restrictions. We are deeply indebted to Rex Hall of the United Kingdom for his assistance in identifying a greater number of Soviet cosmonauts than previously possible based on information he has been able to obtain from the Soviet Union about cosmonauts who were selected into the corps, but who never made spaceflights. He also made some of his photographs available for our use.

The biographical material in this report was updated by Karl Rohrer, a Presidential Management Intern working with the Science Policy Research Division (SPRD), and George Havas, who was detailed to SPRD from his usual duties in the Science and Technology Division of the Library of Congress. Marcia Smith, Specialist in Aerospace Policy in SPRD, was the overall coordinator for the project, and prepared the statistical tables.

Sincerely,

JOSEPH ROSS,
Director.

CONTENTS

Page

Letter of Transmittal III
Letter of Submittal V
Introduction 1

PART I—U.S. MISSIONS

Chapter One: NASA Astronaut Program 3
  Table 1-1: Status of NASA Astronauts by Group 4
  A. Selection Criteria 8
    Education and Experience 8
      Table 1-2: Educational Status of Astronauts at Time of Selection. 13
      Table 1-3a: Astronaut Service Affiliation at Time of Selection. 15
      Table 1-3b: Civilian Astronaut Service Affiliation Prior to Selection 16
    Medical and Psychological 16
  B. Biographies of NASA Astronauts 19
    Table 1-4: Summary of NASA Astronauts 193
    Table 1-5: NASA Astronaut Cumulative Space Time 201
Chapter Two: X-15, X-20 Dyna-Soar, and Manned Orbiting Laboratory Programs 205
  A. Program Descriptions 205
  B. Biographies of X-15, X-20 Dyna-Soar and MOL Astronauts 207
    Table 2-1: Summary of X-15, X-20 and MOL Astronauts 240
    Table 2-2: Summary of U.S. Government Astronaut Programs 242
Chapter Three: Payload Specialists and Passengers on U.S. Missions 243
  Biographies of Payload Specialists and Passengers on U.S. Missions 245
    Table 3-1: Summary of Payload Specialists and Passengers on U.S. Missions 302
    Table 3-2: Cumulative Payload Specialist and Passenger Space Time on U.S. Missions 304

PART II—SOVIET MISSIONS

Chapter Four: Soviet Cosmonaut Program 305
  Table 4-1: Status of Soviet Cosmonauts by Group 307
  Biographies of Soviet Cosmonauts 311
    Table 4-2: Summary of Soviet Cosmonauts 385
    Table 4-3: Cumulative Soviet Cosmonaut Space Time 390
Chapter Five: Foreign Cosmonaut-Researchers on Soviet Missions 393
  Table 5-1: Status of Foreign Cosmonaut-Researchers on Soviet Missions by Group 394
  Biographies of Foreign Cosmonaut-Researchers on Soviet Missions 395
    Table 5-2: Summary of Foreign Cosmonaut-Researchers on Soviet Missions 425
    Table 5-3: Cumulative Foreign Cosmonaut-Researcher Space Time on Soviet Missions 425

PART III—COMPARATIVE TABLES

Chapter Six: Comparative Data on U.S. and Soviet Spaceflights 427
  Table 6-1: U.S. and U.S.S.R. Piloted Missions 428
  Table 6-2a: U.S. Piloted Spaceflight Crew Members by Program 436
  Table 6-2b: U.S.S.R. Piloted Spaceflight Crew Members by Program 439
  Table 6-3: Comparative Time Spent on Space Missions 441

Page

Chapter Six—Continued

Table 6–4: Comparative Time Spent on Extravehicular Activity 445
Table 6–5: Deceased Astronauts and Cosmonauts 447

INTRODUCTION

This volume of ***Astronauts and Cosmonauts: Biographical and Statistical Data*** updates the last edition, published in 1985. Those familiar with this reference book will recognize a slight change in the format.

Part I covers all participants in U.S. space missions. Chapter One includes biographical and statistical data on astronauts in the NASA astronaut corps—active, resigned, and deceased. Chapter Two covers the other U.S. flight programs which qualified (or would have qualified) participants as astronauts: the X–15, X–20 Dyna-Soar and the Manned Orbiting Laboratory. Chapter Three includes all payload specialists (U.S. and foreign) and passengers who have flown, were backups, or are scheduled as primary or backup crew members on U.S. missions. These individuals are not part of the NASA astronaut corps, even though some of them work for other parts of NASA.

Part II details participants on Soviet missions. Chapter Four covers what is known about the Soviet cosmonaut corps, while Chapter Five concerns foreign "cosmonaut-researchers" who have flown on Soviet missions.

Part III contains a series of comparative tables on U.S. and Soviet spaceflights.

PART I: U.S. MISSIONS

CHAPTER ONE—NATIONAL AERONAUTICS AND SPACE ADMINISTRATION ASTRONAUT PROGRAM

Since 1959, 172 astronauts have been chosen by the National Aeronautics and Space Administration (NASA). As of June 30, 1989, there were 89 on active status, 66 had resigned, and 17 had died. Of the 172 chosen, 113 have been from the military, and 59 were civilians when selected for the astronaut corps (although 23 had prior military service).

The astronauts are chosen in groups. To date, NASA has selected 12 groups: Group I, April 9, 1959, seven chosen; Group II, September 17, 1962, nine chosen; Group III, October 18, 1963, 14 chosen; Group IV, June 28, 1965, six chosen; Group V, April 4, 1966, 19 chosen; Group VII, August 14, 1969, seven transfers from the Department of Defense Manned Orbiting Laboratory Program (MOL); [1] Group VIII, January 16, 1978, 35 chosen; Group IX, May 29, 1980, 19 chosen; Group X, May 23, 1984, 17 chosen; Group XI, June 4, 1985, 13 chosen; and Group XII, June, 1987, 15 chosen. Beginning with the 1978 group, individuals selected as astronauts spend one year as an "astronaut-candidate" before formally becoming a member of the astronaut corp. At this time, there are no astronaut-candidates. Table 1-1 shows the current status of NASA's astronaut corps by group.

In addition to the astronauts described here, NASA has selected people to serve as payload specialists and spaceflight passengers. A number of foreign countries have also selected payload specialists to fly with their payloads. These individuals are covered in Chapter Three.

During the Mercury, Gemini, Apollo, Skylab, Apollo-Soyuz, and Space Shuttle programs, 114 NASA astronauts have made space flights, accumulating a total of 40,840 hours and 9 minutes in space. (If the time accumulated by payload specialists and passengers is added, a total of 44,568 hours and 14 minutes has been accumulated by all individuals who have flown on U.S. space missions.) In addition, 41 astronauts have amassed 237 hours and 22 minutes of extravehicular (EVA) time in space, as well as 162 hours and 13 minutes of EVA time on the lunar surface.

---

[1] For more information on the MOL program, see Chapter Two.

TABLE 1-1.—STATUS OF ASTRONAUTS BY GROUP

Name	Year of first flight [1]	Current status
Group I—1959		
Mercury Pilots:		
Carpenter	1962	Resigned
Cooper	1963	Resigned
Glenn	1962	Resigned
Grissom	1961	Deceased
Schirra	1962	Resigned
Shepard, A	1961	Resigned
Slayton	1975	Resigned
Group II—1962		
Pilot-Astronauts:		
Armstrong	1966	Resigned
Borman	1965	Resigned
Conrad	1965	Resigned
Lovell	1965	Resigned
McDivitt	1965	Resigned
See	none	Deceased
Stafford	1965	Resigned
White	1965	Deceased
Young	1965	Active
Group III—1963		
Pilot-Astronauts:		
Aldrin	1966	Resigned
Anders	1968	Resigned
Bassett	none	Deceased
Bean	1969	Resigned
Cernan	1966	Resigned
Chaffee	none	Deceased
Collins	1966	Resigned
Cunningham	1968	Resigned
Eisele	1968	Deceased
Freeman	none	Deceased
Gordon	1966	Resigned
Schweickart	1969	Resigned
Scott	1966	Resigned
Williams, C	none	Deceased
Group IV—1965		
Scientist-Astronauts:		
Garriott	1973	Resigned
Gibson, E	1973	Resigned
Graveline	none	Resigned
Kerwin	1973	Resigned
Michel	none	Resigned
Schmitt	1972	Resigned
Group V—1966		
Pilot-Astronauts:		
Brand	1975	Active
Bull	none	Resigned
Carr	1973	Resigned
Duke	1972	Resigned
Engle	1981 [2]	Resigned
Evans	1972	Resigned
Givens	none	Deceased
Haise	1970	Resigned
Irwin	1971	Resigned
Lind	1985	Resigned
Lousma	1973	Resigned
Mattingly	1972	Resigned
McCandless	1984	Active

TABLE 1-1.—STATUS OF ASTRONAUTS BY GROUP—Continued

Name	Year of first flight [1]	Current status
Group V—1966—Continued		
Mitchell	1971	Resigned
Pogue	1973	Resigned
Roosa	1971	Resigned
Swigert	1970	Deceased
Weitz	1973	Active
Worden	1971	Resigned
Group VI—1967		
Scientist-Astronauts:		
Allen, J.	1982	Resigned
Chapman	none	Resigned
England	1985	Resigned
Henize	1985	Resigned
Holmquest	none	Resigned
Lenoir	1982	Resigned
Llewellyn	none	Resigned
Musgrave	1983	Active
O'Leary	none	Resigned
Parker	1983	Active
Thornton, W.	1983	Active
Group VII—1969		
Ex-MOL Astronauts:		
Bobko	1983	Resigned
Crippen	1981	Resigned
Fullerton	1982	Resigned
Hartsfield	1982	Active
Overmyer	1982	Resigned
Peterson	1983	Resigned
Truly	1981	Resigned
Group VIII—1978		
Pilots:		
Brandenstein	1983	Active
Coats	1984	Active
Covey	1985	Active
Creighton	1985	Active
Gibson, R	1984	Active
Gregory	1985	Active
Griggs	1985	Deceased
Hauck	1984	Resigned
McBride	1984	Resigned
Nagel	1985	Active
Scobee	1985	Deceased
Shaw	1983	Active
Shriver	1985	Active
Walker, D.	1984	Active
Williams, D	1984	Active
Mission Specialists:		
Bluford	1983	Active
Buchli	1985	Active
Fabian	1985	Resigned
Fisher, A	1983	Active
Gardner, D	1984	Resigned
Hart	1984	Resigned
Hawley	1984	Active
Hoffman	1985	Active
Lucid	1985	Active
McNair	1984	Deceased
Mullane	1984	Active

TABLE 1-1.—STATUS OF ASTRONAUTS BY GROUP—Continued

Name	Year of first flight [1]	Current status
Group VIII—1978—Continued		
Nelson, G	1984	Resigned
Onizuka	1985	Deceased
Resnik	1984	Deceased
Ride	1984	Resigned
Seddon	1985	Active
Stewart	1984	Resigned
Sullivan	1984	Active
Thagard	1983	Active
van Hoften	1984	Resigned
Group IX—1980		
Pilots:		
Blaha	1989	Active
Bolden	1986	Active
Bridges	1985	Resigned
Gardner, G	1988	Active
Grabe	1985	Active
O'Connor	1985	Active
Richards	[1989]	Active
Smith	none	Deceased
Mission Specialists:		
Bagian	1989	Active
Chang-Diaz	1986	Active
Cleave	1985	Active
Dunbar	1985	Active
Fisher, W	1985	Active
Hilmers	1985	Active
Leetsma	1984	Active
Lounge	1985	Active
Ross	1985	Active
Spring	1985	Resigned
Springer	1989	Active
Group X—1984		
Pilots:		
Cameron	[1990]	Active
Casper	[1990]	Active
Culbertson	pending	Active
Gutierrez	pending	Active
Hammond	pending	Active
McCulley	[1989]	Active
Wetherbee	[1989]	Active
Mission Specialists:		
Adamson	[1989]	Active
Baker, E	[1989]	Active
Brown, M	[1989]	Active
Carter	[1989]	Active
Ivins	[1989]	Active
Lee	1989	Active
Low	[1989]	Active
Shepard, W	1988	Active
Thornton, K	[1989]	Active
Veach	pending	Active
Group XI—1985		
Pilots:		
Baker, M	pending	Active
Cabana	pending	Active
Duffy	pending	Active
Henricks	pending	Active

TABLE 1-1.—STATUS OF ASTRONAUTS BY GROUP—Continued

Name	Year of first flight[1]	Current status
Group XI—1985—Continued		
Oswald	pending	Active
Thorne	none	Deceased
Group XI—1985—Continued		
Mission Specialists:		
Apt	[1990]	Active
Gemar	pending	Active
Godwin	[1990]	Active
Hieb	pending	Active
Jernigan	[1990]	Active
Meade	pending	Active
Thuot	[1990]	Active
Group XII—1987		
Pilots:		
Allen, A.	pending	Active
Bowersox	pending	Active
Brown, C.	pending	Active
Chilton	pending	Active
McMonagle	pending	Active
Readdy	pending	Active
Reightler	pending	Active
Mission Specialists:		
Akers	pending	Active
Davis	pending	Active
Foale	pending	Active
Harbaugh	pending	Active
Jemison	pending	Active
Melnick	pending	Active
Runco	pending	Active
Voss	pending	Active

---

[1] Astronauts who have been assigned to missions which have not yet flown are shown with the scheduled launch year in brackets. Actual launch date may vary.

[2] Engle earned his astronaut designation while flying the X-15 in the early 1960s; 1981 was the year he first made an actual spaceflight. See his biography, and Chapter 3.

A. SELECTION CRITERIA

The selection criteria for astronauts has changed significantly since the first group of Mercury astronauts were chosen in 1959. The following sections explain how selection criteria have evolved over the past 30 years.

EDUCATION AND EXPERIENCE

When NASA was formed in 1958 and the need for an astronaut corps was first recognized, a decision had to be made on criteria for recruiting astronauts. Robert Sherrod, in *Apollo Expeditions to the Moon,* states that President Eisenhower was responsible for the decision to choose astronauts from the ranks of military test pilots.

> In December 1958, plans had been made to post civil service notices inviting applications for astronaut service, GS-12 to GS-15, salary $8,330 to $12,770. President Eisenhower thought this ridiculous, and decided that the rolls of military test pilots would furnish all the astronauts necessary. "It was one of the best decisions he ever made," said Robert Gilruth sixteen years later. "It ruled out the matadors, mountain climbers, scuba divers, and race drivers and gave us stable guys who had already been screened for security." [2]

The requirements for this first group of astronauts were officially established as: Be less than 40 years of age, have a bachelor's degree in engineering or its equivalent, be a graduate of a test pilot school, and be a qualified jet pilot with at least 1,500 hours of flying time. The selection resulted in choosing the seven Mercury astronauts, all military jet test pilots: Lt. M. Scott Carpenter, USN; Capt. L. Gordon Cooper, Jr., USAF; Lt. Col. John Glenn, Jr., USMC; Capt. Virgil "Gus" Grissom, USAF; Lt. Comdr. Walter Schirra, Jr., USN; Lt. Comdr. Alan Shepard, USN; and Capt. Donald "Deke" Slayton, USAF. Three had engineering degrees (Cooper, Grissom and Slayton), two had bachelor of science degrees from the Naval Academy (Schirra and Shepard), and two had attended college but not received degrees (Carpenter and Glenn).

For the second group of astronauts, chosen in 1962, requirements were changed slightly, with the age bracket lowered to 35 years of age and educational experience broadened to include degrees in the physical or biological sciences as well as engineering. This person also had to have "experience as a jet test pilot having attained experimental flight test status through the military services, the aircraft industry or NASA, or having graduated from a military test pilot school. Preference will be given to those presently engaged in flying high-performance aircraft." This latter modification opened the selection process to civilians, and in the group of nine chosen, two were civilians (Neil Armstrong and Elliot See). In addition, there were four from the Air Force (Maj. Frank Borman, Capt. James McDivitt, Capt. Thomas Stafford, and Capt. Edward White II), and three from the Navy (Lt. Charles "Pete" Conrad, Jr., Lt. Comdr. James Lovell, and Lt. Comdr. John Young). Three of the men (Borman, See and White) had master's degrees in engineering, four had bachelor's degrees in engineering (Armstrong, Conrad, McDivitt and Young), and two received bachelor's degrees of science from the Naval Academy (Lovell and Stafford).

---

[2] Robert Sherrod. Men for the Moon: How They Were Chosen and Trained. In Edgar Cortright, ed. Apollo Expeditions to the Moon. Washington, D.C., National Aeronautics and Space Administration, 1975. p. 146.

Another change in the qualifications was made for the third group of astronauts in 1963. They were required to have only 1,000 hours flight time, and the age limit was lowered to 34. The change in flying time allowed for increased emphasis on academics rather than flight experience and opened the field to non-test pilots. Fourteen men were selected, eight of whom had advanced degrees: Maj. Edwin "Buzz" Aldrin, Jr., USAF (Ph.D., astronautics); Capt. William Anders, USAF (M.S., engineering); Capt. Charles Bassett II, USAF (B.S., engineering); Lt. Alan Bean, USN (B.S., engineering); Lt. Eugene Cernan, USN (M.S., engineering); Lt. Roger Chaffee, USN (B.S., engineering); Capt. Michael Collins, USAF (B.S. from the U.S. Military Academy); R. Walter Cunningham, civilian (M.S., physics); Capt. Donn Eisele, USAF (M.S., astronautics); Capt. Theodore Freeman, USAF (M.S., engineering); Lt. Comdr. Richard Gordon, USN (B.S., chemistry); Russell Schweickart, civilian (M.S., aeronautics and astronautics); Capt. David Scott, USAF (M.S., aeronautics and astronautics); and Capt. Clifton Williams, Jr., USMC (B.S., engineering).

In this group, there were two civilians, along with seven men from the Air Force, four from the Navy, and one from the Marine Corps. Even though qualifications were changing, the military was still supplying the large majority of astronauts (26 of the 30 chosen by 1963).

The fourth group of astronauts differed significantly from its predecessors, for this was the first group of "scientist-astronauts." Applicants were required to hold a doctoral degree in one of the natural sciences, medicine or engineering. The National Academy of Sciences evaluated the applications for scientific criteria, and NASA made the final determination of six men to become astronauts: Dr. Owen Garriott (engineering); Dr. Edward Gibson (engineering); Dr. Duane Graveline (medicine); Lt. Comdr. Joseph Kerwin, USN (medicine); Dr. F. Curtis Michel (physics); and Dr. Harrison "Jack" Schmitt (geology). For the first time, civilians outnumbered the military. The men were not required to have any flight experience, although two (Kerwin and Michel) already were jet pilots. With the exception of Graveline, who resigned from the corps shortly after selection, the others received one year of flight training.

The fifth group in 1966 followed the same qualifications as the third group except that the age limit was raised from 34 to 36, and nineteen astronauts were chosen: four civilians, seven Air Force pilots, six Navy pilots and two Marine Corps pilots. Eleven of the nineteen had advanced degrees. Those selected were: Vance Brand, civilian (B.S., engineering, as well as an M.B.A.); Lt. John Bull, USN (B.S., engineering); Capt. Joe Engle, USAF (B.S., engineering); Lt. Comdr. Ronald Evans, USN (M.S., engineering); Maj. Edward

Givens, Jr., USAF (B.S. from the Naval Academy); Fred Haise, Jr., civilian (B.S., engineering); Maj. James Irwin, USAF (M.S., engineering); Don Lind, civilian (Ph.D., physics); Capt. Jack Lousma, USMC (M.S., engineering); Lt. Thomas Mattingly II, USN (B.S., engineering); Lt. Bruce McCandless II, USN (M.S., engineering); Comdr. Edgar Mitchell, USN (Ph.D., aeronautics and astronautics); Maj. William Pogue, USAF (M.S., mathematics); Capt. Stuart Roosa, USAF (B.S., engineering); John Swigert, Jr., civilian (M.S., aerospace science); Lt. Comdr. Paul Weitz, USN (M.S., engineering); and Capt. Alfred Worden, USAF (M.S., engineering).

The sixth group was composed of scientist-astronauts like Group IV, but this time all were civilians. The National Academy of Sciences again evaluated the applicants for scientific criteria, with NASA evaluating on the basis of medical and psychological tests. None of those chosen in this group in 1967 were pilots, so all were sent to jet pilot school for one year. The eleven astronauts chosen were: Joseph Allen (Ph.D., physics); Philip Chapman (Ph.D., instrumentation); Anthony England (M.S., physics); Karl Henize (Ph.D., astronomy); Donald Holmquest (M.D.); William Lenoir (Ph.D., engineering); John Llewellyn (Ph.D., astronomy); Robert Parker (Ph.D., astronomy); and William Thornton (M.D.).

Members of the seventh group of astronauts to join NASA were transfers from the cancelled Manned Orbiting Laboratory program of the Department of Defense. Since the men had already qualified under the Air Force program, qualifications were not issued; however, the seven chosen from among the 14 pilots who applied to transfer were younger than age 36, and those not chosen were older than age 36. The seven transfers were: Maj. Karol Bobko, USAF (B.S. from the Air Force Academy); Lt. Comdr. Robert Crippen, USN (B.S., engineering); Maj. Charles Fullerton, USAF (M.S., engineering); Maj. Henry Hartsfield, USAF (B.S., physics); Maj. Robert Overmyer, USMC (M.S., astronautics); Maj. Donald Peterson, USAF (M.S., engineering); and Lt. Comdr. Richard Truly, USN (B.S., engineering).

For the eighth group of astronauts chosen in 1978, selection criteria were substantially different from those for the other seven groups of astronauts. Applicants could qualify either as a pilot-astronaut or a mission specialist-astronaut. Those in the mission specialist category were required to have only a bachelor's degree in engineering, physical or biological sciences, or mathematics, while those in the pilot category were required to have a bachelor's degree in engineering, physical science or mathematics with at least 1,000 hours of first pilot time. Fifteen pilots were chosen from 659 pilot applicants, of which 147 were military and 512 were civilians (8 were women and 10 were minorities). Twenty mission specialists were chosen from the 5,680 mission specialist applicants of which 161 were from the military and 5,519 were civilians (1,251 were women and 338 were minorities). Those selected in the pilot category were: Lt. Cdr. Daniel Brandenstein, USN (B.S., mathematics/physics); Lt. Cdr. Michael Coats, USN (M.S., administration of science and technology); Maj. Richard Covey, USAF (M.S.aeronautical/ astronautical engineering); Lt. Cdr. John Creighton, USN (B.S., aeronautical engineering); Maj. Frederick Gregory, USAF (B.S. from US Air Force Academy); S. David

Griggs, civilian (M.S., management engineering); Cdr. Frederick Hauck, USN (M.S., nuclear engineering); Lt. Cdr. Jon McBride, USN (B.S., aeronautical engineering); Capt. Steven Nagel, USAF (B.S., aeronautical/astronautical engineering); Maj. Francis Scobee, USAF (B.S., aerospace engineering); Capt. Brewster Shaw, Jr., USAF (M.S., engineering mechanics); Capt. Loren Shriver, USAF (M.S., astronautics); Lt. Cdr. David Walker, USN (B.S. from U.S. Naval Academy); and Lt. Cdr. Donald Williams, USN (B.S., mechanical engineering). Those selected in the mission specialist category were: Maj. Guion Bluford, USAF (Ph.D., aerospace engineering); Capt. James Buchli, USMC (M.S., aeronautical systems); Maj. John Fabian, USAF (Ph.D., aeronautics/astronautics); Anna Fisher, civilian (M.D.); Lt. Dale Gardner, USN (B.S., engineering physics); Terry Hart, civilian (M.S., mechanical engineering); Steven Hawley, civilian (Ph.D., astronomy); Jeffrey Hoffman (Ph.D., astrophysics); Shannon Lucid, civilian (Ph.D., biochemistry); Ronald McNair, civilian (Ph.D., physics); Capt. Richard Mullane, USAF (M.S., aeronautical engineering); George Nelson, civilian (Ph.D., astronomy); Capt. Ellison Onizuka, USAF (M.S., aerospace engineering); Judith Resnik, civilian (Ph.D., electrical engineering); Sally Ride, civilian (Ph.D., physics); Margaret Seddon, civilian (M.D.); Maj. Robert Stewart, USA (M.S., aerospace engineering); Kathryn Sullivan; civilian (Ph.D., geology); Norman Thagard, civilian (M.D.); and James van Hoften, civilian (Ph.D., fluid mechanics).

The ninth group of astronauts was chosen in 1980 using the same criteria as group eight. Of the nineteen astronauts selected, eight were chosen as pilots and eleven as mission specialists. In the pilot category were: Lt. Col. John Blaha, USAF (M.S., astronautical engineering); Maj. Charles Bolden, Jr., USMC (M.S., systems management); Lt. Col. Roy Bridges, Jr., USAF (M.S., astronautics); Maj. Guy Gardner, USAF (M.S., aeronautics and astronautics); Maj. Ronald Grabe, USAF (B.S., engineering science); Maj. Bryan O'Connor, USMC (M.S., aeronautical systems); Lt. Cdr. Richard Richards, USN (M.S., aeronautical systems); and Lt. Cdr. Michael Smith, USN (M.S., aeronautical engineering). The mission specialists were: Dr. James Bagian (medicine); Dr. Franklin Chang-Diaz (physics); Dr. Mary Cleave (civil and aeronautical engineering); Bonnie Dunbar (M.S., ceramic engineering); Dr. William Fisher (medicine); Capt. David Hilmers, USMC (M.S., electrical engineering); Lt. Cdr. David Leetsma, USN (M.S., aeronautical engineering); John Lounge (M.S., astrogeophysics); Capt. Jerry Ross, USAF (M.S., mechanical engineering); Maj. Sherwood Spring, USAF (M.S., aerospace engineering); and Lt. Col. Robert Springer, USMC (M.S., operations research and systems analysis).

In 1984, the tenth group was also chosen based on the same criteria as the previous two groups. This group included seven pilots and ten mission specialists. The pilot astronauts were: Maj. Kenneth Cameron, USMC (M.A., aeronautics and astronautics); Lt. Cmdr. Frank Culbertson, Jr., USN (B.S., aerospace engineering); Lt. Col. John Casper, USAF (M.A., astronautics); Capt. Sidney Gutierrez, USAF (M.A., management); Capt. Lloyd Hammond, Jr., USAF (M.A., engineering mechanics); Lt. Cmdr. Michael McCulley, USN (M.A., metallurgical engineering); and Lt. James Wetherbee, USN (B.S., engineering). The mission specialists were: Maj. James

Adamson, USA (M.A., aeronautics and mechanical engineering); Capt. Mark Brown, USAF (M.A., engineering); Cmdr. Manley Carter, Jr., USN (M.D.); Marsha Ivins (B.S., aerospace engineering); Capt. Mark Lee, USAF (M.A., mechanical engineering); George Low (M.A., aeronautics and astronautics); Lt. Cmdr. William Shepard, USN (M.A., engineering); Ellen Shulman (M.D.); Kathryn Thornton (Ph.D., physics); and Charles Veach (B.S., engineering management).

The eleventh group of astronauts was selected in 1985. It included six pilots and seven mission specialists. The pilot astronauts include: Lt. Cmdr. Michael A. Baker, USN (B.S., aerospace engineering); Maj. Robert D. Cabana, USMC (B.S., mathematics); Capt. Brian Duffy, USAF (M.S., systems management); Maj. Terence Henricks, USAF (Master of Public Administration); Stephen S. Oswald (B.S., aerospace engineering); and Lt. Cmdr. Stephen D. Thorne, USN (B.S., systems engineering). The mission specialists chosen were: Jerome Apt (Ph.D., physics); Capt. Charles Gemar, USA (B.S., engineering); Linda Godwin (Ph.D., physics); Richard Hieb (M.S., aerospace engineering): Tamara Jernigan (Ph.D., physics); Capt. Carl J. Meade, USAF (M.S., electrical engineering); and Lt. Pierre J. Thuot, USN (M.S. systems management).

In 1987 the same set of criteria was used to select another astronaut class. Group XII included 15 astronauts—seven pilots and eight mission specialists. The pilot astronauts selected were: Capt. Andrew W. Allen, USMC (B.S. mechanical engineering); Lt. Cmdr. Kenneth D. Bowersox, USN (M.S. mechanical engineering); Capt. Curtis L. Brown, USAF (B.S. electrical engineering); Maj. Kevin P. Chilton, USAF (M.S. mechanical engineering); Maj. Donald R. McMonagle, USAF (M.S. mechanical engineering); William F. Readdy (B.S. aerospace engineering); and Cmdr. Kenneth S. Reightler, USN (M.S. aerospace engineering and systems management). The mission specialists included: Maj. Thomas D. Akers, USAF (M.S. mathematics); N. Jan Davis (Ph.D., engineering); C. Michael Foale (Ph.D., physics); Gregory J. Harbaugh (M.S. physical science); Mae C. Jemison (M.D.); Cmdr. Bruce E. Melnick, USCG (M.S. aeronautics); Lt. Cmdr. Mario Runco (M.S. meteorology); and Maj. James S. Voss, USA (M.S. aerospace engineering).

NASA is currently seeking applications for the next astronaut class which will be selected in mid-1990. NASA has announced plans to select new astronauts on a two-year cycle.

In summary, educational and experience qualifications for the pilot astronauts (Groups I, II, III and V) varied only slightly from 1959 to 1966, with the major change occurring in 1962 (Group II) when civilians were allowed to apply. Other changes included lower age limits, reduction of required number of flying hours from 1,500 to 1,000, and increased emphasis on academic degrees. Criteria for the two groups of scientist-astronauts (Groups IV and V) were basically the same, the only difference being that those chosen with Group VI were not required to have earned their doctoral degrees by the time of selection. The astronauts chosen since 1978 have had more lenient criteria for selection than their predecessors. Table 1-2 shows the educational status of individuals at the time they were selected by NASA as astronauts.

TABLE 1-2.—EDUCATIONAL STATUS OF ASTRONAUTS AT TIME OF SELECTION

Bachelor's	Master's	Doctorate
B.S.:	Aeronautics/	Aeronautics/
Bobko	Astronautics:	Astronautics:
Collins	Adamson	Aldrin
Creighton	Bridges	Fabian
Givens	Buchli	Mitchell
Lovell	Cameron	
Schirra	Casper	Engineering:
Shepard, A.	Duke	Bluford
Stafford	Eisele	Chapman
Walker, D.	Gardner, G.	Cleave
	Low	Davis
Engineering:	Melnick	Garriott
Allen, A.	O'Connor	Gibson, E.
Armstrong	Overmyer	Lenoir
Baker, M.	Richards	Resnik
Bassett	Schweickart	van Hoften
Bean	Scott	
Brown, C.	Shriver	Physics:
Bull	Swigert	Allen, J.
Chaffee		Apt
Conrad	Engineering:	Chang-Diaz
Cooper	Anders	Godwin
Crippen	Blaha	Jernigan
Culbertson	Borman	Lind
Engle	Bowersox	McNair
Gemar	Brown, M.	Michel
Gibson, R.	Carr	Thornton, K.
Grabe	Cernan	
Grissom	Chilton	Astronomy/
Haise	Covey	Astrophysics:
Ivins	Dunbar	Foale
Mattingly	Evans	Hawley
McBride	Freeman	Henize
McDivitt	Fullerton	Hoffman
Nagel	Griggs	Nelson, G.
Oswald	Hart	O'Leary
Readdy	Hauck	Parker
Reightler	Hieb	
Roosa	Hilmers	Chemistry:
Scobee	Irwin	Llewellyn
Slayton	Lee	Lucid
Thorne	Leestma	
Truly	Lousma	Geology:
Wetherbee	McCandless	Schmitt
Williams, C.	McCulley	Sullivan
Williams, D.	McMonagle	
Young	Meade	M.D.:
	Mullane	Bagian
Engineering Mgmt.:	Onizuka	Baker, E.
Veach	Peterson	Carter
	Ross	Fisher, A.
Physics:	See	Fisher, W.
Brandenstein	Shepard, W.	Graveline
Gardner, D.	Smith	Holmquest
Hartsfield	Spring	Jemison
	Stewart	Kerwin
Chemistry:	Voss	Musgrave
Gordon	Weitz	Seddon
	White	Thagard
	Worden	Thornton, W.

TABLE 1-2.—EDUCATIONAL STATUS OF ASTRONAUTS AT TIME OF SELECTION—Continued

Bachelor's	Master's	Doctorate
Mathematics:	Engineering Mech.:	
Cabana	Hammond	
	Shaw	
No Degree:		
Carpenter	Physics:	
Glenn	Cunningham	
	England	
	Harbaugh	
	Lounge	
	Ride	
	Mathematics:	
	Akers	
	Pogue	
	Meteorology:	
	Runco	
	Systems Mgmt.:	
	Bolden	
	Duffy	
	Gregory	
	Springer	
	Thuot	
	M.B.A./M.P.A.:	
	Brand	
	Coats	
	Gutierrez	
	Henricks	

Of the 172 men and women chosen as astronauts by NASA, 113 were reassigned from the military, and 23 of the 59 selected as civilians had prior military service. Of those reassigned from the armed forces, 52 were from the Air Force, 42 were from the Navy, 13 were from the Marine Corps, 5 were from the Army and 1 was from the Coast Guard. Table 1–3 provides a breakdown of service affiliations at the time of selection into the astronaut corps. The remaining 36 civilians were all chosen as scientist-astronauts or mission specialists in Group IV, VI, VIII, IX, X, XI or XII. They include: J. Allen, Apt, E. Baker, Chang-Diaz, Cleave, Davis, Dunbar, England, A. Fisher, W. Fisher, Foale, Garriott, E. Gibson, Godwin, Harbaugh, Hawley, Hieb, Hoffman, Holmquest, Ivins, Jemison, Jernigan, Lenoir, Llewellyn, Low, Lucid, McNair, G. Nelson, O'Leary, Parker, Resnik, Ride, Schmitt, Seddon, Sullivan, and K. Thornton.

TABLE 1–3a.—ASTRONAUT SERVICE AFFILIATION AT TIME OF SELECTION

Air Force

Akers
Aldrin
Anders
Bassett
Blaha
Bluford
Bobko
Borman
Bridges
Brown, C.
Brown, M.
Casper
Chilton
Collins
Cooper
Covey
Duffy
Duke
Eisele
Engle
Fabian
Freeman
Fullerton
Gardner, G.
Givens
Grabe
Gregory
Grissom
Gutierrez
Hammond
Hartsfield
Henricks
Irwin
Lee
McDivitt
McMonagle
Meade
Mullane
Nagel
Onizuka
Peterson
Pogue
Roosa
Ross
Scobee
Scott
Shaw
Shriver
Slayton
Stafford
White
Worden

Army

Adamson
Gemar
Spring
Stewart
Voss

Coast Guard

Melnick

Navy

Baker, M.
Bean
Bowersox
Brandenstein
Bull
Carpenter
Carter
Cernan
Chaffee
Coats
Conrad
Creighton
Crippen
Culbertson
Evans
Gardner, D.
Gibson, R.
Gordon
Hauck
Kerwin
Leetsma
Lovell
Mattingly
McBride
McCandless
McCulley
Mitchell
Reightler
Richards
Runco
Schirra
Shepard, A.
Shepard, W.
Smith
Thorne
Thuot
Truly
Walker
Weitz
Wetherbee
Williams, D.
Young

Marine Corps

Allen, A.
Bolden
Buchli
Cabana
Cameron
Carr
Glenn
Hilmers
Lousma
O'Connor
Overmyer
Springer
Williams, C.

TABLE 1–3b.—CIVILIAN ASTRONAUT SERVICE AFFILIATION PRIOR TO SELECTION

		Air Force		
Chapman [1]	Hart	Schweickart	Thornton	Veach
Graveline	Michel	Swigert		
		Army		
		Bagian		
		Navy		
Armstrong	Henize	Lounge	Readdy	van Hoften
Griggs	Lind	Oswald	See	
		Marine Corps		
Brand	Cunningham	Haise [2]	Musgrave [3]	Thagard

[1] Chapman served in the Royal Australian Air Force.
[2] Haise served in both the Marine Corps and the Air Force.
[3] Musgrave served in both the Marine Corps and the Navy.

MEDICAL AND PSYCHOLOGICAL

In addition to the educational and experience qualifications, the first seven groups of astronauts had to pass vigorous medical and psychological tests. Dr. Robert Voas, a psychologist who was the Mercury astronauts' training director, is quoted as giving the following characteristics as requirements:

> . . . intelligence without genius, knowledge without inflexibility, bravery without foolhardiness, self-confidence without egotism, physical fitness without being musclebound, a preference for participatory over spectator sports, frankness without blabber-mouthing, enjoyment of life without excess, humor without disproportion, fast reflexes without panic in a crisis.[3]

To identify people who could meet these qualifications, medical and psychological tests were administered over five days, consisting of the following components:

1. Medical history and review of systems.
2. Physical examination.
3. Electrocardiographic examinations, including routine electrocardiographic studies at rest, during hyperventilation, carotid massage, and breath holding, a double Master exercise tolerance test, a cold pressure test, and a precordial map.
4. Treadmill exercise tolerance test.
5. Vectorcardiographic study.
6. Phonocardiographic study.
7. Tilt table studies.
8. Pulmonary function studies.
9. Radiographic studies, including cholecystograms, upper GI series, lumbosacral spine, chest, cervical spine, and skull films.
10. Body composition study, using tritium dilution.

---

[3] Ibid., p. 146.

11. Laboratory examinations, including complete hematology workup, urinalysis, serologic test, glucose tolerance test, acid alkaline phosphatase, BUN, sodium, potassium, bicarbonate, chloride, calcium, phosphorus, magnesium, uric acid, bilirubin (direct and indirect), thymol turbidity cephalin flocculation, SGOT, SGPT, total protein with albumin and globulin, separate determination of Alpha 1 and Alpha 2, Beta and Gamma Globulins, protein bound iodine, creatinine, cholesterol, total lipids and phospholipids, hydroxproline, and RBC intracellular sodium and potassium. Stool specimens were examined for occult blood and microscopically for ova and parasites. A urine culture for bacterial growth was done, and a 24-hour specimen analyzed for 17-ketosteroids and 17-hydroxycorticosteroids.
12. Detailed examination of the sinuses, larynx, and Eustachian tubes.
13. Vestibular studies.
14. Diagnostic hearing tests.
15. Visual fields and special eye examinations.
16. General surgical evaluation.
17. Procto-sigmoidoscopy.
18. Dental examination.
19. Neurological examination.
20. Psychologic summary, including Weschler Adult Intelligence Test, Bender Visual-Motor Gestalt Test, Rorschach Test, Thematic Apperception Test, Draw-A-Person Test, Gordon Personal Profile, Edwards' Personal Preference Schedule, Miller Analogies Test, and Performance Testing.
21. Electroencephalographic studies.
22. Centrifuge testing.[4]

Michael Collins (Gemini 10, Apollo 11) has provided a more humanistic perspective of what all those tests were like:

> Monday morning you arrived, fasting, to be greeted by a pleasant lab technician, part Dracula and part leech, who takes what seems to be a quart of blood. You then breakfast at regular intervals during the remainder of the morning. . . . Inconvenience is piled on top of uncertainty on top of indignity, as you are poked, prodded, pummeled, and pierced. No orifice is inviolate, no privacy respected. . . . Cold water is poured into one of your ears, causing your eyeballs to gyrate wildly as conflicting messages are relayed to your brain from one warm and one cold semicircular canal. Your body is taped with electrocardiogram sensors and you are ordered onto a treadmill, which maintains its inexorable pace up an imaginary mountain road. As the tilt becomes steeper, the heart rate increases, until it finally reaches 180 per minute. . . . Your fanny is violated by the "steel eel," a painful and undignified process by which one foot of lower bowel can be examined.
>
> Then the shrinks take over where their more stable compatriots leave off. Thrust and parry. What are inkblots

---

[4] Richard S. Johnston, Lawrence F. Dietlein, and Charles A. Berry, eds. Biomedical Results of Apollo. Washington, D.C., National Aeronautics and Space Administration, 1975, pp. 45–46.

> supposed to be anyway? Is one crotch in ten pictures too many? How can I describe the blank, white piece of paper this year? Last year I said it was nineteen polar bears fornicating in a snow bank, and the interviewer's face tightened in obvious displeasure over my lack of reverence for his precious cards. Hostile, they said I was. But not this year. This year I want to fly to the moon, badly I want it, and I will describe that white card in any way that will please them. Perhaps I see a great white room in it, or a picture of Mother and Dad, with Dad a little larger than Mother. Second-guessing the shrinks is not easy.[5]

Some interesting statistics can be derived from those who did pass through all the tests and became astronauts in that first decade of sending people into space. In a study of the 29 Apollo astronauts, it was found that seven were left-handed (over twice what the odds would predict), nine were not chosen by NASA the first time they applied, and two had to apply three times. In addition, 22 were first-born children (six of whom were only children), another five were oldest sons, and only two had older brothers, and one of those "hardly knew his brother, who was 13 years older" and received the "only-son treatment the second time around."[6] Although these statistics represent only 29 of the 73 astronauts selected from 1959–1969, they can be used as a representative sampling of the astronaut corps.

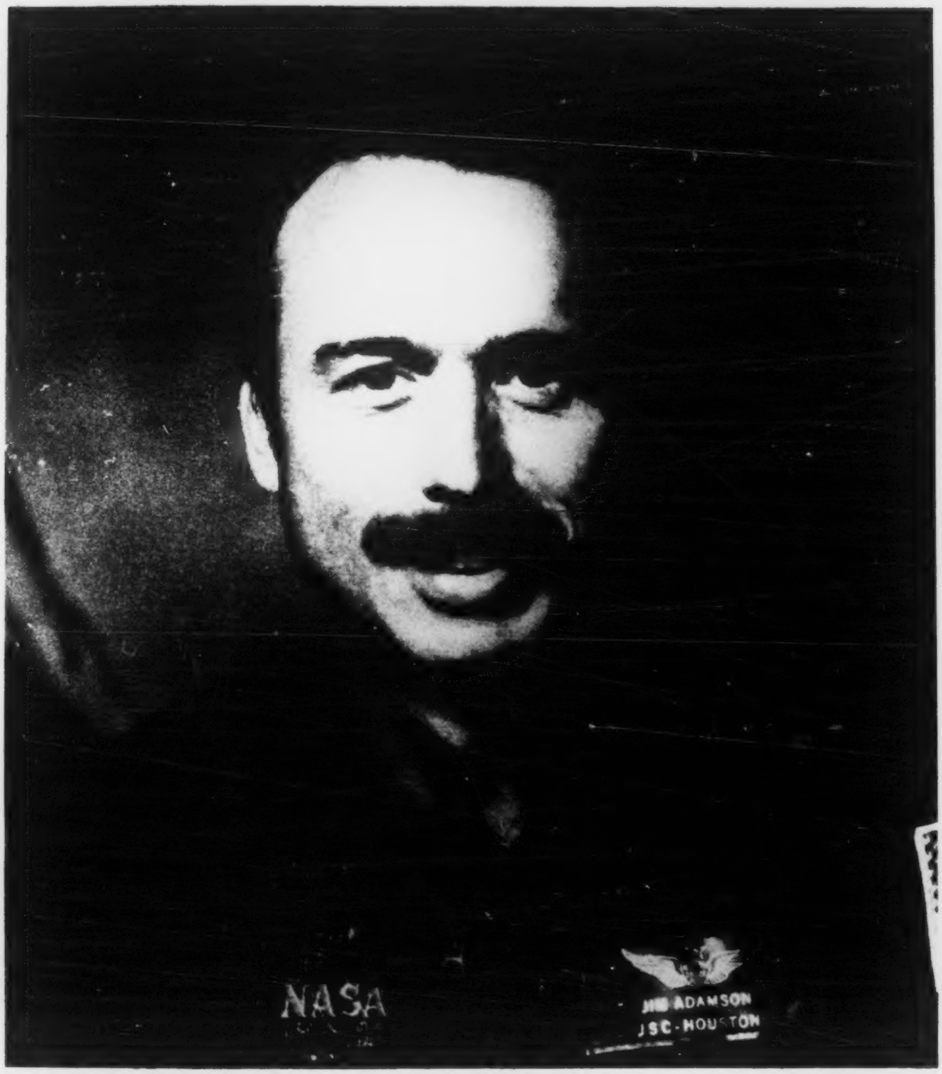
The astronauts chosen since 1978 were required to pass a Class I physical (as described above) only if they were selected as pilots. Mission specialists had to pass a Class II physical, which has more relaxed standards for sight and hearing.

---

[5] Michael Collins. Carrying the Fire: An Astronaut's Journey. New York, Farrar, Straus and Giroux, 1974. pp. 27–28.

[6] Sherrod, op. cit., p. 152.

B. BIOGRAPHIES OF NASA ASTRONAUTS



James C. Adamson; Lieutenant Colonel, USA; born March 3, 1946, Warsaw, New York, married, one child.

Received bachelor of science in engineering from U.S. Military Academy (1969), and master of science in aerospace engineering from Princeton University (1977). He then became an Assistant Professor of aerodynamics at West Point. In 1980, he began employment at Johnson Space Center, serving as aerodynamics officer in the Mission Control Center. Adamson was selected as an astronaut in May 1984, and is now training to serve as a mission specialist on STS-28.

NASA
TOM AKERS

Thomas D. Akers; Major, USAF; born May 20, 1951, St. Louis, Missouri; married, two children.

Received bachelor of science (1973) and master of science (1975) in applied mathematics from the University of Missouri-Rolla. He spent four years as the high school principal in his hometown, Eminence, Missouri before joining the Air Force in 1979. In 1982, he was selected to attend the Air Force Test Pilot School at Edwards Air Force Base, California; after flight test engineer training, he was assigned to the Armament Division at Eglin Air Force Base, Florida. He was serving as the Executive Officer to the Armament Division's Deputy Commander for Research, Development and Acquisition when he was selected as an astronaut in 1987. Akers is currently the astronaut office focal point for Space Shuttle software development, and is awaiting a specific flight assignment.

Edwin "Buzz" Eugene Aldrin, Jr.; Colonel, USAF (Retired); born January 20, 1930, Montclair, New Jersey; married, three children (by a previous marriage). **Spaceflights: Gemini 12, Apollo 11**

Received bachelor of science degree from the U.S. Military Academy (1951), doctor of science in astronautics from the Massachusetts Institute of Technology (1963), and was chosen with the third group of astronauts in 1963. Colonel Aldrin was backup pilot for Gemini 9, pilot for Gemini 12, backup command module pilot for Apollo 8, and lunar module pilot for Apollo 11 (second man to walk on the Moon). He resigned from NASA in July 1971 to become Commandant of the Aerospace Research Pilot's School at Edwards Air Force Base, California. On March 1, 1972, he retired from the Air Force and became a consultant for the Comprehensive Care Corporation, Newport Beach, California. He is currently a consultant in Los Angeles and a professor of astronautics at the University of North Dakota. He has authored two books, *Return to Earth,* and *Men From Earth.*

Andrew M. Allen; Captain, USMC; born August 4, 1955, Philadelphia, Pennsylvania; married, one child.

Received bachelor of science in mechanical engineering from Villanova University (1977) and joined the U.S. Marine Corps as a pilot. He has flown F-4 Phantoms and F/A-18s during his military career and graduated from the Marine Weapons and Tactics Course and the Navy Fighter Weapons School. A 1987 graduate of the U.S. Navy Test Pilot School at Patuxent River, Maryland, Allen was a test pilot under instruction at the time he was selected as an astronaut in June 1987. He is awaiting assignment as a pilot on a future Space Shuttle mission and is currently working on Space Shuttle landing issues.

Joseph P. Allen; civilian, born June 27, 1937, Crawfordsville, Indiana; married, two children. **Spaceflights: STS-5, STS 51-A**

Received bachelor of arts degree in math-physics from DePauw University (1959), master of science in physics from Yale University (1961), doctorate of nuclear physics from Yale (1965), and was chosen with the sixth group of astronauts in 1967. He was mission scientist for Apollo 15 and served on the staff of the President's Council on International Economic Policy. He served as the Director of the Legislative Affairs Division at NASA headquarters from 1975 to 1978. He was a mission specialist on STS-5 and on STS 51-A. Allen, now retired from NASA, is President of Space Industries, Inc. in Houston, Texas.

William Alison Anders; Brigadier General, USAFR; born October 17, 1933, Hong Kong; married, six children. **Spaceflight: Apollo** 8

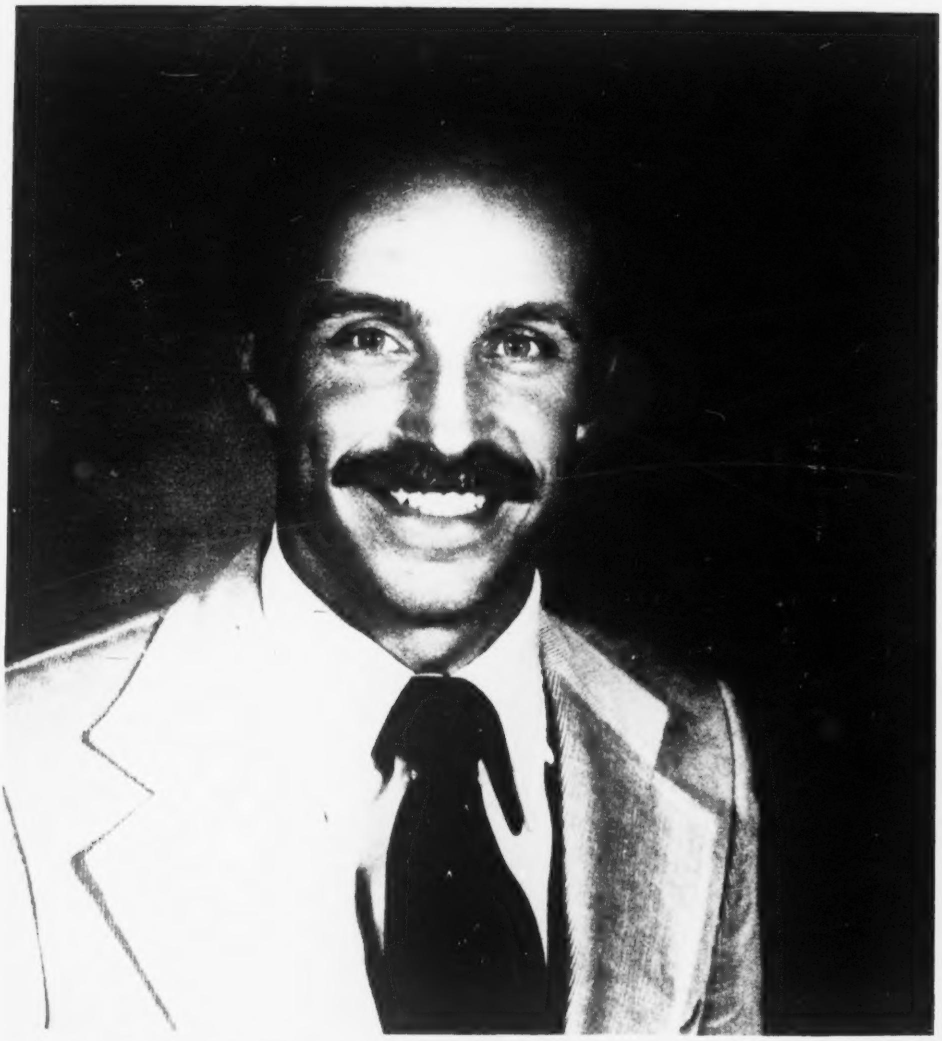
Received bachelor of science degree from the U.S. Naval Academy (1955), master of science in nuclear engineering from the Air Force Institute of Technology (1962), and was chosen with the third group of astronauts in 1963. Colonel Anders was backup pilot for Gemini 11 and lunar module pilot for Apollo 8. He resigned from NASA and the Air Force (active duty) in September 1969 and became Executive Secretary of the National Aeronautics and Space Council. In 1973, he joined the Atomic Energy Commission, and in 1974, became chairman of the Nuclear Regulatory Commission. He resigned that position in the spring of 1976 and was named U.S. Ambassador to Norway. He then became General Manager of General Electric's Nuclear Energy Products division and later was Vice President and General Manager of GE's Aircraft Equipment Division. He is now Senior Executive Vice President-Operations, Textron, Inc.

Jerome Apt; Ph.D.; born April 28, 1949, Springfield, Massachusetts; married, one child.

Received bachelor of arts in physics (magna cum laude) from Harvard (1971) and a doctorate in physics from the Massachusetts Institute of Technology (1976). From 1976 to 1980, Dr. Apt was a staff member of the Center for Earth and Planetary Physics at Harvard University, supporting NASA's Pioneer-Venus mission. In 1980, Dr. Apt joined the Earth and Space Sciences Division of NASA's Jet Propulsion Laboratory, continuing his planetary research; in 1981, he became the manager of JPL's Table Mountain Observatory. From 1982 to 1985, he served as a payload operations flight controller at Johnson Space Center. Selected as an astronaut in 1985, Dr. Apt has worked on mission development for the Hubble Space Telescope and the Gamma Ray Observatory. He is now training as a mission specialist for his first flight, STS-37, where he will assist in deploying the Gamma Ray Observatory.

Neil Alden Armstrong; civilian; born August 5, 1930, Wapakoneta, Ohio; married, two children. **Spaceflights: Gemini 8, Apollo 11**

Received bachelor of science degree in aeronautical engineering from Purdue University (1955), was an aviator in the U.S. Navy, received master of science in aerospace engineering from the University of Southern California (1970), and was chosen with the second group of astronauts in 1962. Armstrong was also in the X–15 program, and made 7 flights of the X–15, reaching an altitude of 207,500 feet. He was backup command pilot for Gemini 5, command pilot for Gemini 8, backup command pilot for Gemini 11, backup commander for Apollo 8, and commander for Apollo 11 (first man to walk on the Moon). In July 1970 he became Deputy Associate Administrator for Aeronautics at NASA. In August 1971 he resigned from that position, and became Professor of Aeronautical Engineering at the University of Cincinnati. Armstrong served on the National Commission on Space from 1985 and 1986, and on the Presidential Commission on the Space Shuttle *Challenger* Accident in 1986. He is currently Chairman of the Board of Computing Technologies for Aviation, Inc.



James Philip Bagian; civilian, born February 2, 1952, Philadelphia, Pennsylvania; married, two children. **Spaceflight: STS–29**

Received bachelor of science in mechanical engineering from Drexel University (1973); and doctor of medicine from Thomas Jefferson University (1977). Worked as a mechanical engineer at the U.S. Naval Air Test Center at Patuxent River, Maryland, from 1976 to 1978; completed a general surgery residency at the Geisinger Medical Center in Danville, Pennsylvania; worked as a flight surgeon and research officer at Lyndon B. Johnson Space Center in 1978; and completed studies at the USAF Flight Surgeons School and USAF School of Aerospace Medicine in San Antonio, Texas. He was finishing his residency in anesthesiology at the University of Pennsylvania when he was chosen as a mission specialist astronaut in 1980. He flew as a mission specialist on STS–29 and is currently training for his next flight—STS–40—a dedicated life sciences Spacelab mission.

NASA
NASA
ELLEN SHULMAN
JSC-HOUSTON
NASA
USA

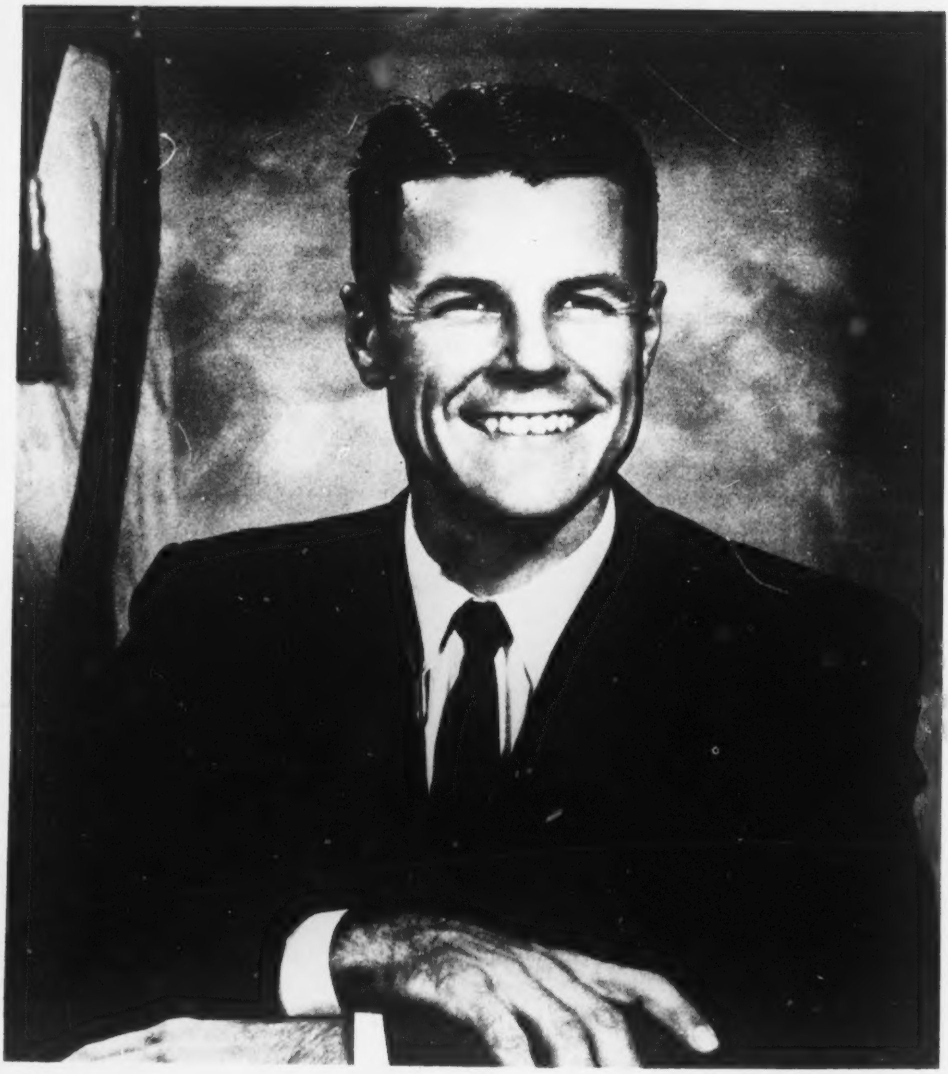
Ellen Shulman Baker; civilian; born April 27, 1953, Fayetteville, North Carolina; married, one child.

Received bachelor of arts in geology from the State University of New York at Buffalo (1974) and doctorate in medicine from Cornell University (1978). She joined NASA as a medical officer at Johnson Space Center, and worked at the Flight Medicine Clinic. Baker was selected as an astronaut in May 1984, and is currently training for her first mission, STS–34, on which she will serve as a mission specialist in deploying the Galileo probe to Jupiter.

NASA
MIKE BAKER
JSC HOUSTON
NASA
SPACE SHUTTLE

Michael A. Baker; Lieutenant Commander, USN; born October 27, 1953, Memphis, Tennessee; married, two children.

Received a bachelor of science in aerospace engineering from the University of Texas (1975) and completed his naval flight training at NAS Chase Field, Beeville, Texas in 1977. In 1981 he graduated from the U.S. Navy Test Pilot School and returned in 1983 as an instructor. Selected as an astronaut in June 1985, he began work on modifications to the Shuttle's landing and deceleration systems and served as the Orbit Capsule Communicator (CAPCOM) for STS-27 in December 1988. He is currently assigned to the Shuttle Avionics Integration Laboratory (SAIL) working on the verification and check-out of flight software, and awaiting assignment to a shuttle mission.



Charles Arthur Bassett II; Major, USAF; born December 30, 1931, Dayton, Ohio; died February 28, 1966, near St. Louis, Missouri, in the crash of a T-38 jet; was married, two children.

Received a bachelor of science in electrical engineering from Texas Technological College (1960) and was selected with the third group of astronauts. Major Basset had been chosen to pilot Gemini 9.

Alan Lavern Bean; Captain, USN (Retired); born March 15, 1932, Wheeler, Texas; divorced, two children. **Spaceflights: Apollo 12, Skylab 3**

Received a bachelor of science degree in aeronautical engineering from the University of Texas (1955), and was chosen with the third group of astronauts in 1963. Captain Bean was backup command pilot for Gemini 10, backup lunar module pilot for Apollo 9, lunar module pilot for Apollo 12 (fourth man to walk on the Moon), commander for Skylab 3, and backup commander for the Apollo-Soyuz Test Project. He retired from the Navy in October 1975 and from NASA on June 26, 1981 to pursue a career as an artist.

John Elmer Blaha; Colonel, USAF; born August 26, 1942, San Antonio, Texas; married, three children. **Spaceflight: STS–29**

Received bachelor of science in engineering science from the U.S. Air Force Academy (1965) and master of science in astronautical engineering from Purdue University (1966). Blaha served as a combat pilot during the Vietnam War; graduated from the USAF Aerospace Research Pilot School at Edwards Air Force Base, California; was an instructor pilot at the USAF Test Pilot School; and worked for the Assistant Chief of Staff, Studies and Analyses, at Headquarters USAF in the Pentagon. He was chosen as a pilot astronaut in 1980. He was the pilot for STS–29 and is currently training to serve as the pilot for STS–40, a Spacelab life sciences mission.

Guion "Guy" Steward Bluford; Colonel, USAF; born November 22, 1942, Philadelphia, Pennsylvania; married, two children. **Spaceflights: STS-8, STS 61-A**

Received bachelor of science in aerospace engineering from Pennsylvania State University (1964); master of science (1974) and doctorate (1977) in aerospace engineering from the Air Force Institute of Technology; and was chosen with the eighth group of astronauts in 1978. He served as a mission specialist for the STS-8 mission, becoming the first American black in space, and was also a mission specialist on STS 61-A (Spacelab D-1).

Karol Joseph Bobko; Colonel, USAF (Retired); born December 23, 1937, New York, New York; married, two children. **Spaceflights: STS-6, STS 51-D, STS 51-J**

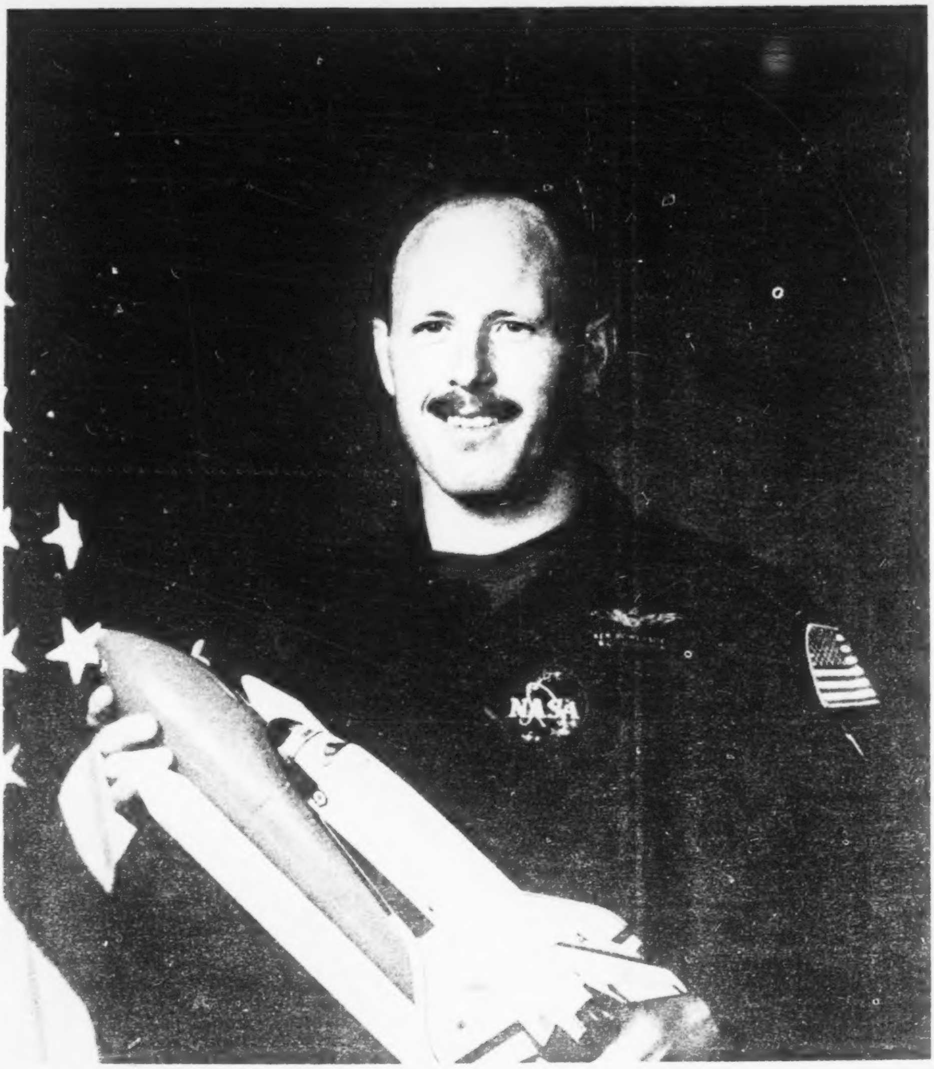
Received bachelor of science degree from the U.S. Air Force Academy (1959), master of science in aerospace engineering from the University of Southern California (1970), was selected for the MOL program in 1966, and transferred to the NASA astronaut program in 1969. He was a crew member of the Skylab Medical Experiments Altitude Test Project, pilot of STS-6, and commander of STS 51-D and STS 51-J. Bobko retired from NASA and the Air Force in 1988 and is currently with the Grumman Corporation in Houston, working on the space station program.

Charles Frank Bolden, Jr.; Colonel, USMC; born August 19, 1946; Columbia, South Carolina; married, two children. **Spaceflight: STS 61-C.**

Received bachelor of science in electrical science from the U.S. Naval Academy (1968); master of science in systems management from the University of Southern California (1978); and was a combat pilot in Vietnam. He graduated from the U.S. Naval Test Pilot School in Patuxent River, Maryland, in 1979 and was a test pilot at the Naval Air Test Center when he was chosen as a pilot astronaut in 1980. Bolden was the pilot for STS 61-C, and is currently assigned to be the pilot for STS-31, the mission which will deploy the Hubble Space Telescope.

Frank Borman; Colonel, USAF (Retired); born March 14, 1928, Gary, Indiana; married, two children. **Spaceflights: Gemini 7, Apollo 8**

Received bachelor of science degree from the U.S. Military Academy (1950), master of science in aeronautical engineering from the California Institute of Technology (1957), and was chosen with the second group of astronauts in 1962. Colonel Borman was backup command pilot for Gemini 4, command pilot for Gemini 7, and commander of Apollo 8. In May 1969 he became Field Director of the Long-Term Space Station Program at NASA. He resigned from NASA and the Air Force on July 1, 1970, to become Senior Vice President, Operations Group for Eastern Airlines. He served as Eastern's President and Vice Chairman, Texas Air Corporation. He resigned from Eastern, and is now an aviation consultant in New Mexico. He has written a book entitled *Countdown*.

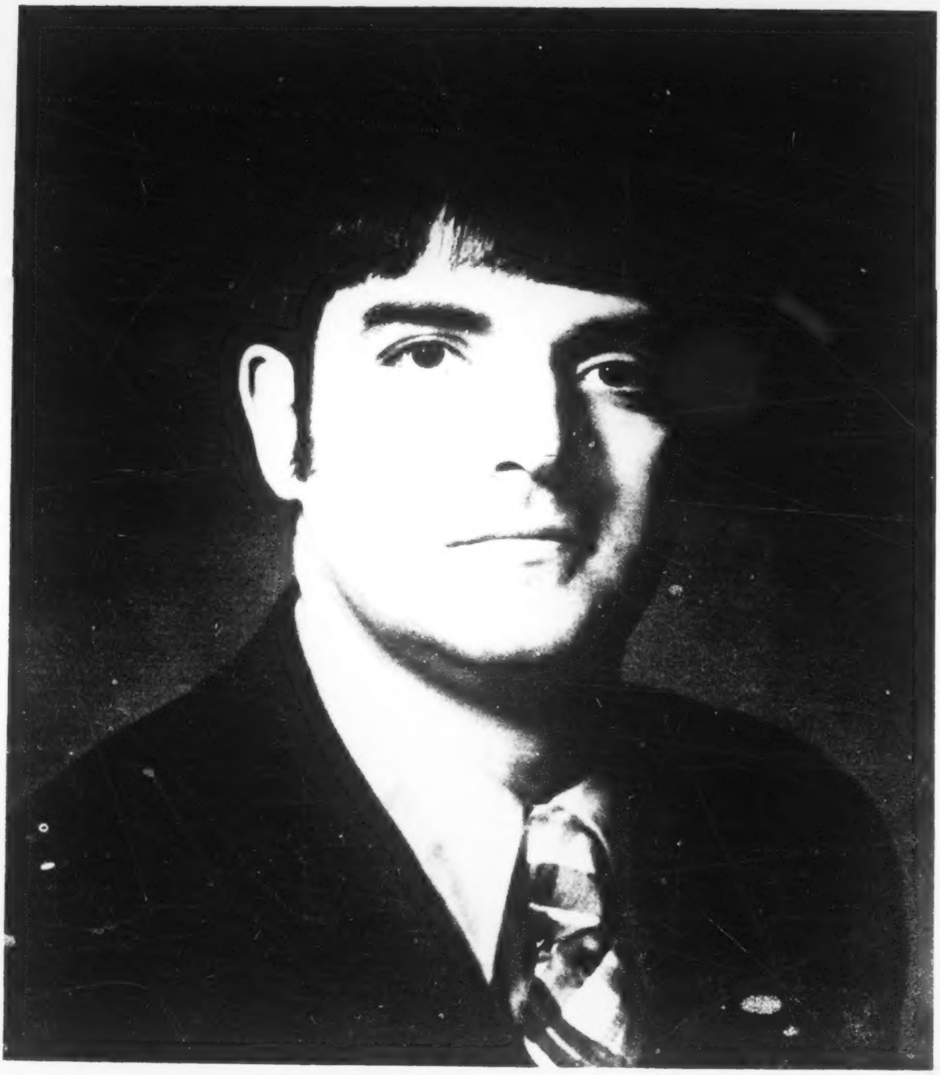


Kenneth D. Bowersox; Lieutenant, USN; born November 14, 1956, Portsmith, Virginia; married.

Received bachelor of science in aerospace engineering from U.S. Naval Academy (1978) and master of science in mechanical engineering from Columbia University (1979). Bowersox was commissioned by the U.S. Navy in 1978 and designated a Naval Aviator in 1981. Following graduation from the U.S. Air Force Test Pilot School in 1985, he moved to the Naval Weapons Center at China Lake, California as a test pilot. He was selected as an astronaut in 1987 and is currently working in the Shuttle Avionics Integration Laboratory (SAIL) at Johnson Space Center and awaiting assignment to a shuttle mission.

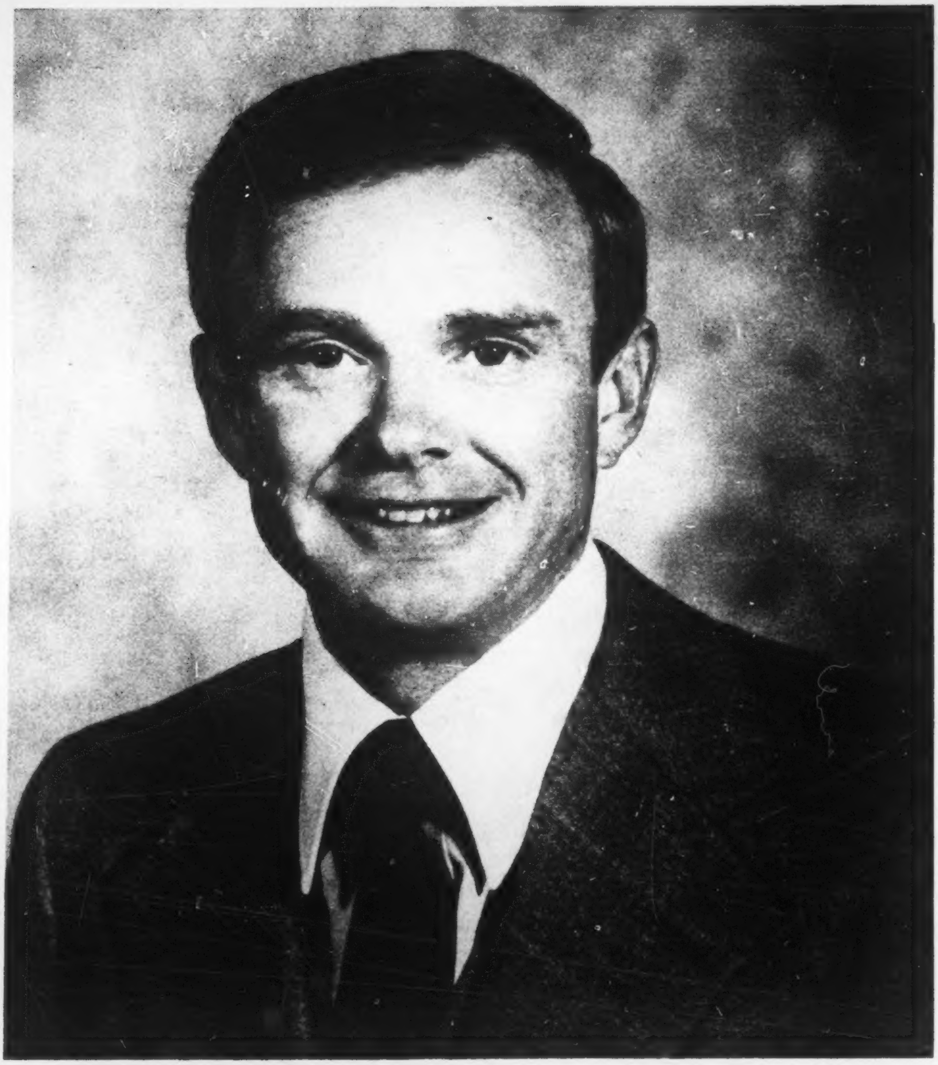
Vance Devoe Brand; civilian; born May 9, 1931, Longmont, Colorado; married, six children (four by a previous marriage). **Spaceflights: Apollo-Soyuz Test Project, STS–5, STS 41–B**

Received bachelor of science degree in business administration from the University of Colorado (1953), bachelor of science in aeronautical engineering from the University of Colorado (1960), master of business administration from the University of California at Los Angeles (1964); served as an aviator with the U.S. Marine Corps, and was chosen with the fifth group of astronauts in 1966. Mr. Brand was backup command module pilot for Apollo 15, backup commander for Skylab 3 and Skylab 4, command module pilot for the Apollo-Soyuz Test Project, and commander of two shuttle missions, STS–5 and STS 41–B.



Daniel Charles Brandenstein; Captain, USN; born January 17, 1943, Watertown, Wisconsin; married, one child. **Spaceflights: STS-8 STS 51-G**

Received bachelor of science in mathematics/physics from the University of Wisconsin (1965) and was chosen with the eighth group of astronauts in 1978. Brandenstein entered the Navy in 1965 and was designated a naval aviator in 1967. He served two combat tours in Vietnam, flying 192 missions. Prior to being selected as an astronaut, Brandenstein served as a test pilot and flight instructor. He was the pilot of STS-8 and commander of STS 51-G. Currently he is training to be the commander of STS-32, the LDEF retrieval mission.



Roy Bunbard Bridges, Jr.; Colonel, USAF; born July 19, 1943, Atlanta, Georgia; married, two children. **Spaceflight: STS 51–F**

Received bachelor of science in engineering science from U.S. Air Force Academy (1965) and master of science in astronautics from Purdue University (1966). He was a combat pilot in Vietnam and later graduated from USAF Test Pilot School at Edwards Air Force Base, California (1970), remaining there as a test pilot until 1975. He was a special projects officer at Detachment 3 of the Air Force Test Center when chosen as a pilot astronaut in 1980. He served as pilot on STS 51–F. He resigned from NASA to continue his military career as Commander of the 6510th Test Wing at Edwards Air Force Base. He is currently the Commander of the Eastern Missile and Space Center, Patrick Air Force Base, Florida.

Curtis L. Brown; Captain, USAF; born March 11, 1956 in Elizabethtown, North Carolina; married, one child.

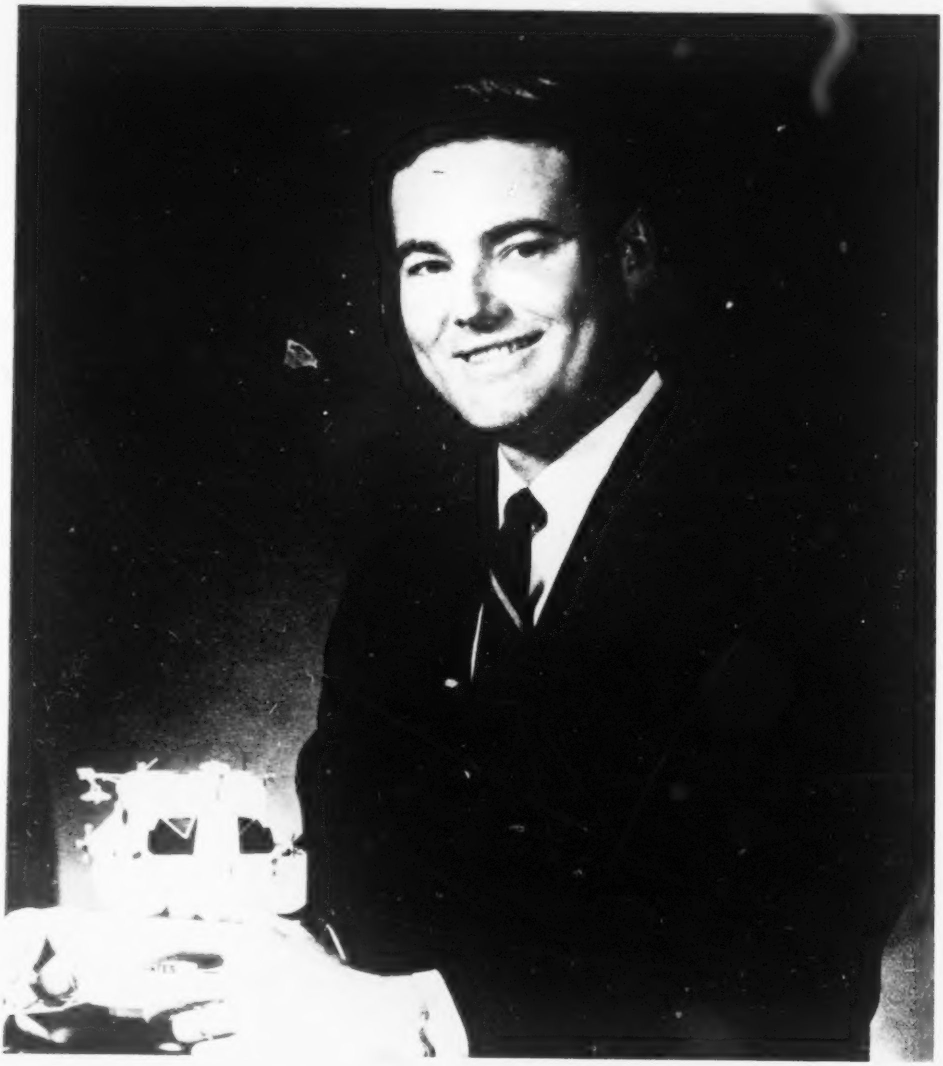
Received bachelor of science in electrical engineering from the U.S. Air Force Academy (1978) and after flight training, was assigned to fly A-10s. He has attended USAF Fighter Weapons School and USAF Test Pilot School. Prior to his selection for the astronaut program in 1987, Brown was a test pilot at Eglin Air Force Base, Florida. Now qualified for future assignment as a Space Shuttle pilot, he is currently working on the Shuttle Mission Simulator upgrades.

Mark N. Brown; Major, USAF; born November 18, 1951, Valparaiso, Indiana; married, one child.

Received bachelor of science in aeronautical and astronautical engineering, Purdue University (1973), and master's in astronautical engineering, Air Force Institute of Technology (1980). He has been employed at Johnson Space Center since 1980. Brown was selected as an astronaut in 1984 and is currently training to serve as a mission specialist on STS-28, a classified Department of Defense mission.

James Frederick Buchli; Colonel, USMC; born June 20, 1945, New Rockford, South Dakota; married, two children. **Spaceflights: STS 51-C, STS 61-A, STS-29**

Received bachelor of science from U.S. Naval Academy (1967) and a master of science in aeronautical systems from University of West Florida (1975). Chosen with the eighth groups of astronauts in 1978, Buchli was a member of the support crew for STS-1 and STS-2, and on-orbit CAPCOM for STS-2. He was a mission specialist on STS 51-C; STS 61-A (Spacelab D-1); and STS-29.

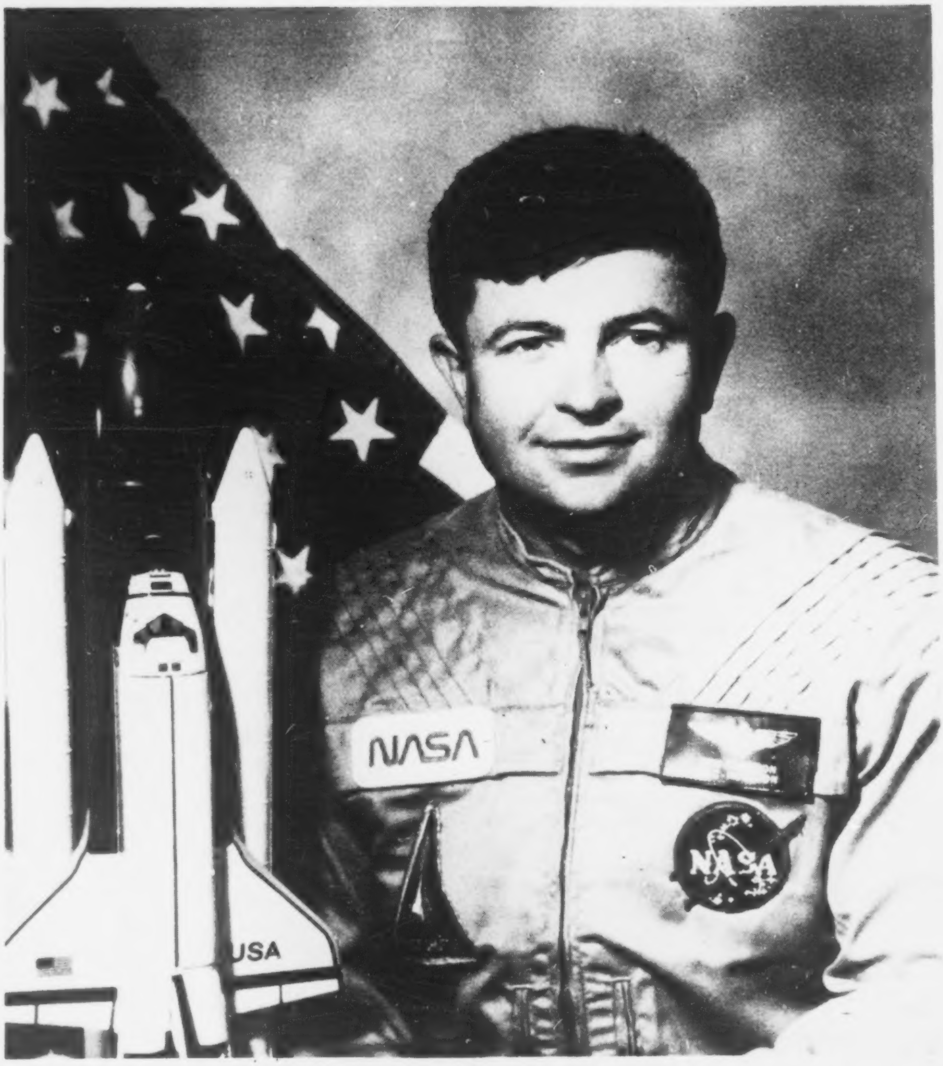


John Sumter Bull; Lieutenant Commander, USN (Retired); born September 25, 1935, Memphis, Tennessee; married, two children.
Received bachelor of science degree in mechanical engineering from Rice University (1957), a doctorate in aeronautics and astronautics from Stanford University (1973), and was chosen with the fifth group of astronauts in 1966. Commander Bull withdrew from the astronaut program and the Navy in 1968 due to pulmonary disease, and is currently a research scientist for aircraft guidance and navigation at NASA Ames Research Center, Moffett Field, California.

NASA
NASA
SHUTTLE
CABANA
HOUSTON

Robert D. Cabana; Lieutenant Colonel, USMC; born January 23, 1949, Minneapolis, Minnesota; married, three children.

Received bachelor of science in mathematics from U.S. Naval Academy (1971) and completed Naval Flight Officer training in 1972. He served as an A-6 Bombardier/Navigator and completed his pilot training in 1975. Cabana has graduated from the U.S. Naval Test Pilot School and served at the Naval Air Test Center in Patuxent River, Maryland. He was selected as an astronaut in June 1985 and since then has served as the astronaut office flight software coordinator and Deputy Chief of Aircraft Operations at Johnson Space Center. He is currently working on mission support issues for the astronaut office and awaiting a flight assignment.



Kenneth D. Cameron; Lieutenant Colonel, USMC; born November 29, 1949, Cleveland, Ohio; married, one child.

Received bachelor's and master's degrees in aeronautics and astronautics, Massachusetts Institute of Technology (1978 and 1979). Cameron joined the Marine Corps in 1969 and served as a Platoon Commander in Vietnam. He became a naval aviator in 1973 and following assignments in Japan and in the Pacific, he graduated from the U.S. Navy Test Pilot School and subsequently served as a test pilot and project officer. Cameron was selected in the 1984 astronaut class, and is currently training to be pilot of STS-37, which will deploy the Gamma Ray Observatory.

Malcolm Scott Carpenter; Commander, USN (Retired); born May 1, 1925, Boulder, Colorado; married, four children (by a previous marriage). **Spaceflight: Mercury-Atlas 7**

Attended University of Colorado, but did not graduate (he was awarded an earned degree of engineering after his space flight), and was chosen in the first group of astronauts in 1959. Commander Carpenter was backup pilot for Mercury-Atlas 6 (Friendship 7), and the pilot of Mercury-Atlas 7 (Aurora 7). An elbow injury from a motorbike accident in Bermuda in 1964 removed him from flight status, and he resigned from NASA in August 1967 to join the U.S. Navy Project Sealab. He retired from the Navy on July 1, 1969, and has since worked as an engineering consultant. He is currently a Fellow at the Institute of Environmental Sciences concentrating on oceanographic and energy research.

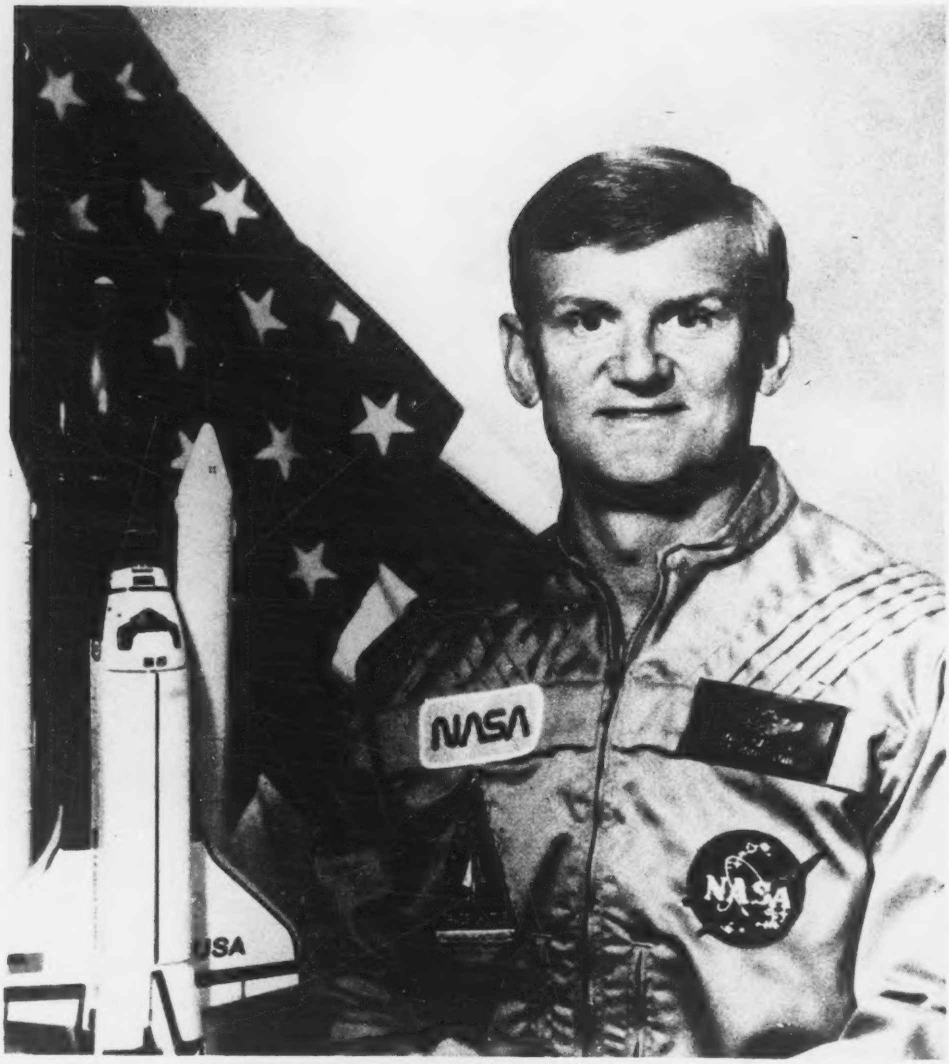
Gerald Paul Carr; Colonel, USMC (Retired); born August 22, 1932, Denver, Colorado; married, six children (by a previous marriage).

Spaceflight: Skylab 4

Received bachelor of science degree in mechanical engineering from the University of Southern California (1954), bachelor of science in aeronautical engineering from the U.S. Naval Postgraduate School (1961), master of science in aeronautical engineering from Princeton University (1962), and was chosen with the fifth group of astronauts in 1966. Colonel Carr was instrumental in the development of the lunar roving vehicle used by the Apollo 15, 16, and 17 astronauts, and was commander of Skylab 4. He retired from the Marine Corps in September 1975 and resigned from NASA in June 1977. He was Vice President, Bovay Engineers, Inc., and is now a senior consultant for Applied Research Inc., in Houston, Texas.

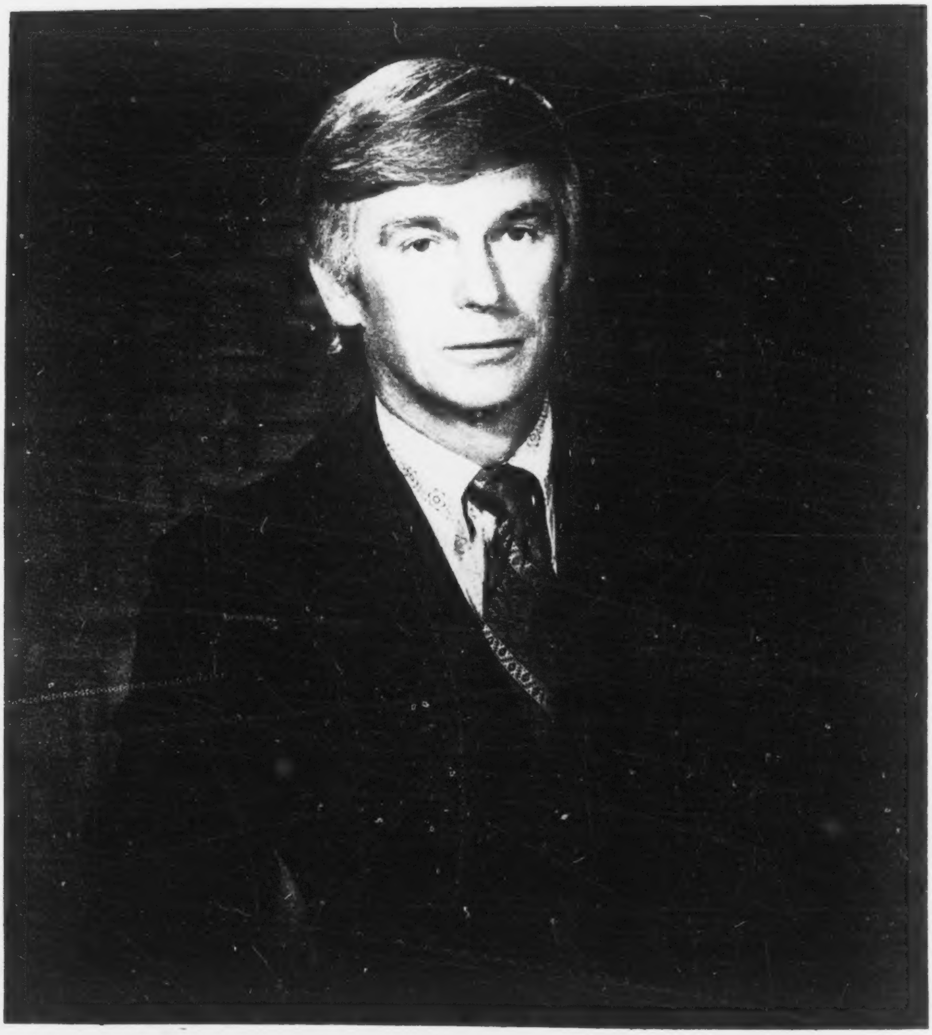
Manley "Sonny" Lanier Carter, Jr.; Captain, USN; born August 15, 1947, Macon, Georgia; married, two children.

Received bachelor of arts in chemistry from Emory University (1969), and doctor of medicine from Emory (1973). In 1974, he joined the Navy and completed flight surgeon school in Pensacola, Florida. His career in the Navy has included tours as both a flight surgeon and fighter pilot. Carter graduated from the U.S. Navy Test Pilot School in 1984 and was selected in the 1984 astronaut class. He is currently training to serve as a mission specialist on STS–33, a Department of Defense mission.



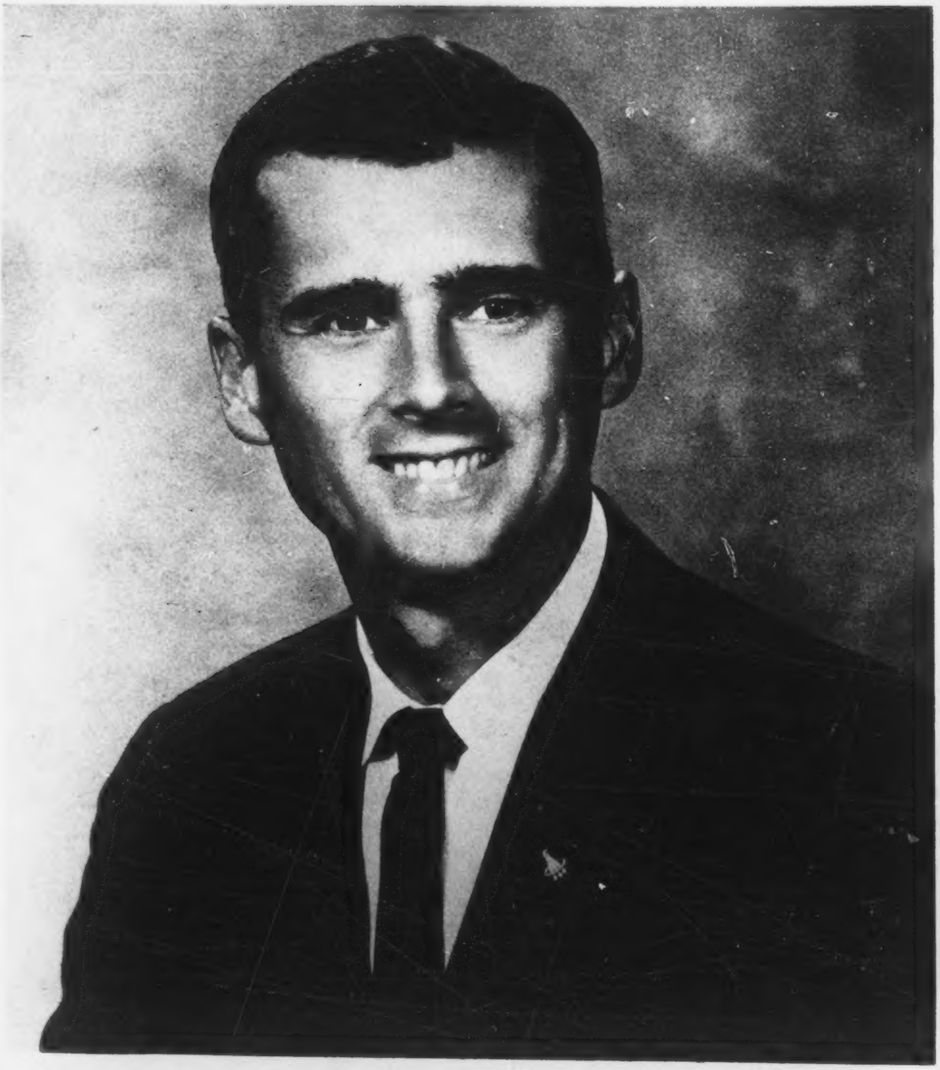
John H. Casper; Colonel, USAF; born July 9, 1943, Greenville, South Carolina; married, one child.

Received bachelor of science in engineering science from the Air Force Academy (1966) and master of science in astronautics from Purdue University (1967). During his Air Force career, Casper has flown combat missions in Vietnam, served as a test pilot and commanded a test squadron. Prior to selection as an astronaut in 1984, he was Deputy Chief of the Special Projects Office at the Pentagon. Casper is currently training to serve as the pilot of STS–36, a Department of Defense mission.



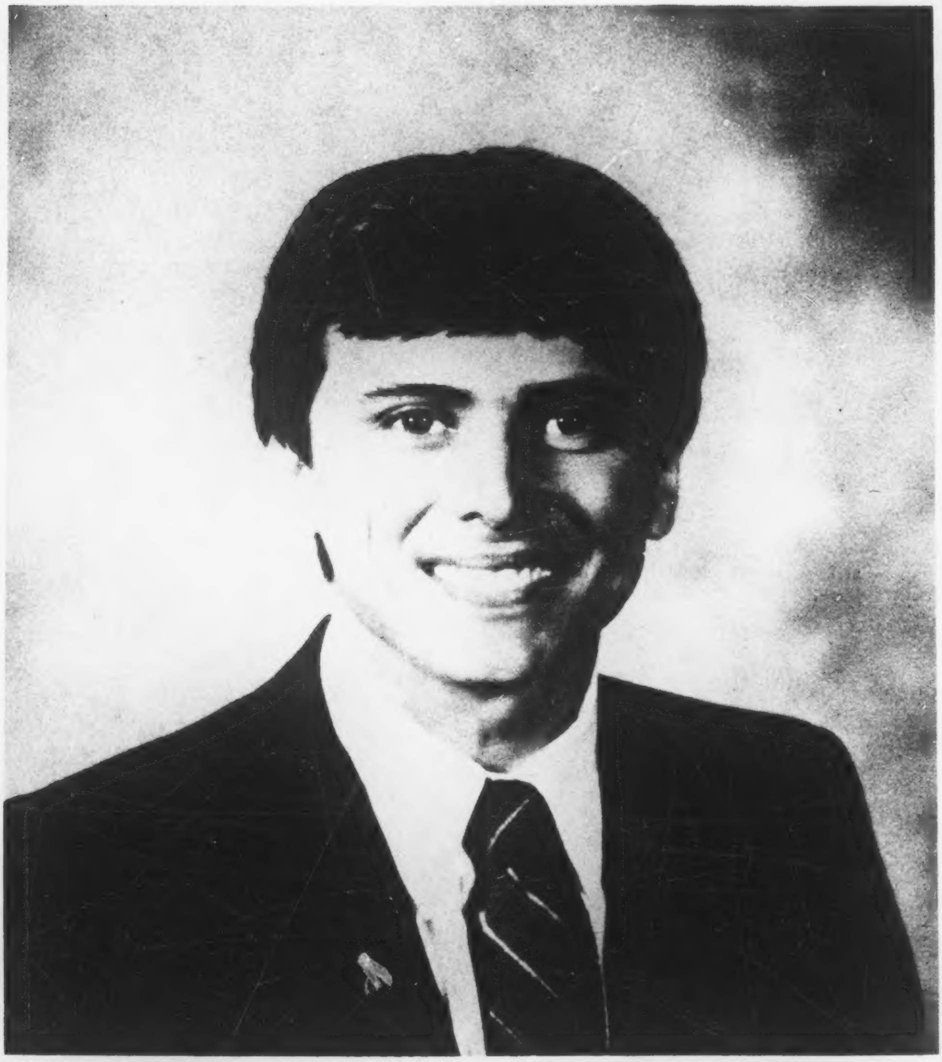
Eugene Andrew Cernan; Captain, USN (Retired), born March 14, 1934, Chicago, Illinois; married, one child (by a previous marriage). **Spaceflights: Gemini 9, Apollo 10, Apollo 17**

Received bachelor of science degree in electrical engineering from Purdue University (1956), master of science in aeronautical engineering from Purdue and the Naval Postgraduate School (1961), and was chosen in the third group of astronauts in 1963. He became the pilot of Gemini 9 upon the death of a prime crew member, was backup pilot for Gemini 12, backup lunar module pilot for Apollo 7, lunar module pilot for Apollo 10, backup commander for Apollo 14, and commander for Apollo 17 (eleventh man to walk on the Moon). Captain Cernan was Deputy Director of the Apollo-Soyuz Test Project. He resigned from NASA and the Navy on July 1, 1976, to become Executive Vice President-International, Coral Petroleum, Inc., Houston, Texas. He is currently the President of Cernan Corporation, Houston, Texas.



Roger Bruce Chaffee; Lieutenant Commander, USN; born February 15, 1935; Grand Rapids, Michigan; died January 27, 1967, in the Apollo 204 fire at Cape Kennedy, Florida; was married, two children.

Received bachelor of science degree in aeronautical engineering from Purdue University (1957), and was chosen in the third group of astronauts in 1963. He had been selected as lunar module pilot for the first Apollo flight.



Franklin Ramon Chang-Diaz; civilian; born April 5, 1950, San Jose, Costa Rica (is a naturalized U.S. citizen); married, two children (by a previous marriage). **Spaceflight: STS 61-C**

Received bachelor of science in mechanical engineering from the University of Connecticut (1973); doctorate in applied plasma physics from the Massachusetts Institute of Technology (1977); and worked on the technical staff of the Charles Stark Draper Laboratory on fusion reactors. He was chosen as a mission specialist astronaut in 1980 and flew STS 61-C. Chang-Diaz is currently training as a mission specialist for STS-34, which will deploy the Galileo probe to Jupiter.

Philip Kenyon Chapman; civilian; born March 5, 1935, Melbourne, Australia; became U.S. citizen May 8, 1967; divorced, two children.

Received bachelor of science degree in physics and mathematics from Sydney University (1956), served in the Royal Australian Air Force Reserve, received master of science in aeronautics and astronautics from the Massachusetts Institute of Technology (1964), doctorate in instrumentation from MIT (1967), and was chosen in the sixth group of astronauts in 1967. Dr. Chapman resigned from NASA in July 1972 and took a position with AVCO Everett Research Laboratories in Everett, Massachusetts, as well as joining the MIT Measurement Systems Laboratory as a senior research associate. In September 1977, he left AVCO Everett to join Arthur D. Little, Inc. He is currently an independent space consultant.

NASA
KEVIN CHILTON

Kevin P. Chilton; Major, USAF; born November 3, 1954, Los Angeles, California; married.

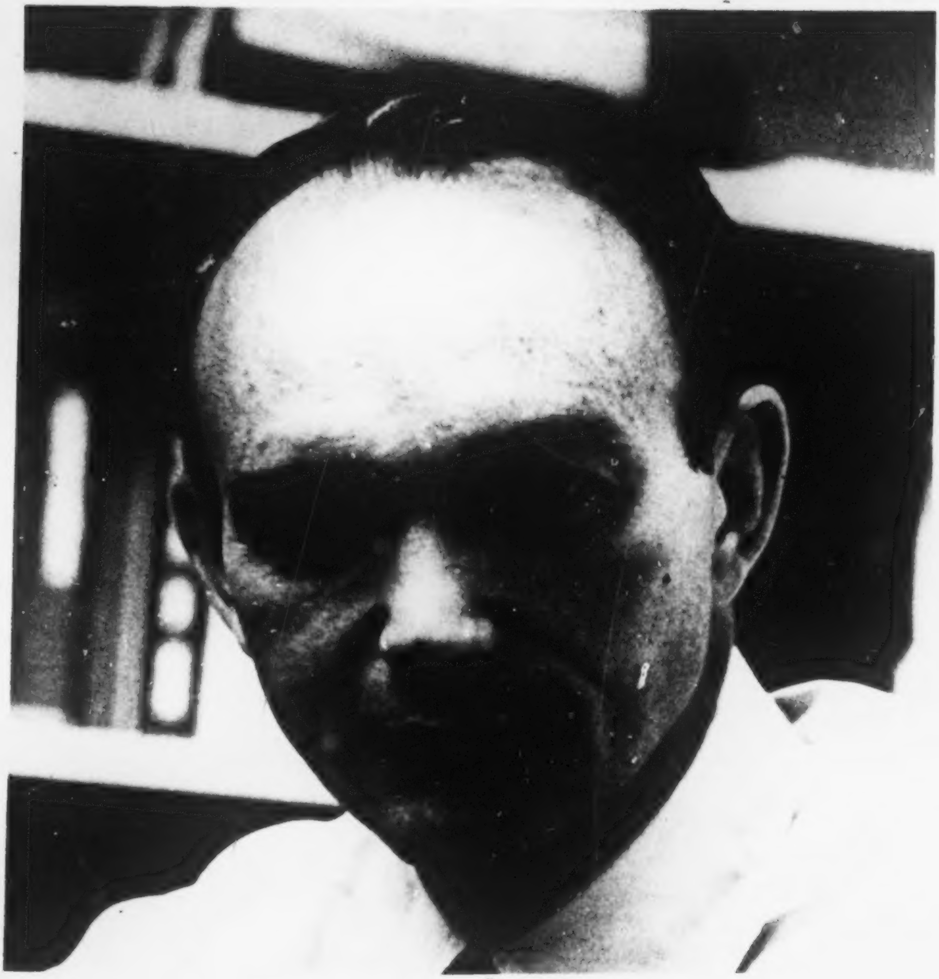
Received bachelor of science in engineering sciences from the U.S. Air Force Academy (1976) and master of science in mechanical engineering from Columbia University (1977). An Air Force pilot since 1978, Chilton attended the USAF Test Pilot School in 1984; after graduation, he was assigned as a test pilot at Eglin Air Force Base, Florida. He was selected as an astronaut in 1987 and is currently assigned to mission development duties in the astronaut office while awaiting a flight assignment.

Mary Louise Cleave; civilian; born February 5, 1947, Southhampton, New York; single. **Spaceflights: STS 61-B, STS-30**

Received bachelor of science in biological sciences from Colorado State University (1969); master of science in microbial ecology (1975); and a doctorate in civil and aeronautical engineering (1979) from Utah State University. She held research positions in the Ecology Center and the Utah Water Research Laboratory at Utah State University from 1971 to 1980, and was selected as a mission specialist astronaut in 1980. She served as a mission specialist on STS 61-B and STS-30.

Michael Loyd Coats; Captain, USN; born January 16, 1946, Sacramento, California; married, two children. **Spaceflights: STS 41-D, STS-29**

Received bachelor of science from U.S. Naval Academy (1968) and a master of science in Administration of Science and Technology from the George Washington University (1977). As a Navy pilot, Coats flew over 300 combat missions in Vietnam, and later served as a flight instructor and test pilot. In 1974, he attended U.S. Navy Test Pilot School. Coats was attending the U.S. Naval Postgraduate School when he was selected for the astronaut program in 1978. He has served as the pilot on STS 41-D and the commander of STS-29.



Michael Collins; Major General, USAFR; born October 31, 1930, Rome, Italy; married, three children. **Spaceflights: Gemini 10, Apollo 11**

Received bachelor of science from the U.S. Military Academy (1952) and was chosen in the third group of astronauts in 1963. General Collins was backup pilot for Gemini 7, pilot for Gemini 10, assigned to Apollo 8 but removed to undergo surgery, and command module pilot for Apollo 11. In January 1970, he resigned from NASA and the Air Force (active duty) and was appointed Assistant Secretary of State for Public Affairs. In April 1971, he became Director of the National Air and Space Museum at the Smithsonian Institution. In April 1978, he was promoted to Under Secretary of the Smithsonian. In February 1980, he became Vice President, Field Operations, Vought Corporation, Arlington, Virginia. He currently heads Michael Collins Associates, a Washington consulting firm. Collins has written numerous articles and two books, *Carrying the Fire* and *Liftoff.* He has also written a children's book, *Flying to the Moon and Other Strange Places.*

Charles "Pete" Conrad, Jr.; Captain, USN (Retired); born June 2, 1930, Philadelphia, Pennsylvania; married, four children. **Spaceflights: Gemini 5, Gemini 11, Apollo 12, Skylab 2**

Received bachelor of science in aeronautical engineering from Princeton University (1953) and was chosen with the second group of astronauts in 1962. Captain Conrad was pilot of Gemini 5, backup command pilot of Gemini 8, command pilot of Gemini 11, backup commander of Apollo 9, commander of Apollo 12 (third man to walk on the Moon), and commander of Skylab 2. He resigned from both NASA and the Navy on February 1, 1974, to become Vice President and Chief Operating Officer of the American Television and Communications Corporation, a cable TV firm in Denver, Colorado. He is currently Vice President for international activities, McDonnell-Douglas Corporation.

Leroy Gordon Cooper, Jr.; Colonel, USAF (Retired); born March 6, 1927, Shawnee, Oklahoma; married, two children (by a previous marriage). **Spaceflights: Mercury-Atlas 9, Gemini 5**

Received bachelor of science degree in aeronautical engineering from the Air Force Institute of Technology (1956) and was chosen in the first group of astronauts in 1959. Colonel Cooper was the backup pilot of Mercury-Alas 8, pilot for Mercury-Atlas 9 (Faith 7), command pilot for Gemini 5, backup command pilot for Gemini 12, and backup commander for Apollo 10. He retired from NASA and the Air Force in July 1970 to form Gordon Cooper Associates in Hialeah, Florida. He then was Vice-President for Research and Development for WED Enterprises, Glendale, California. He is currently President of XL, Inc., a Los Angeles business consulting company.

Richard Oswalt Covey; Colonel, USAF; born August 1, 1946, Fayetteville, Arkansas; married, two children. **Spaceflights: STS 51-I, STS-26**

Received bachelor of science from U.S. Air Force Academy (1968) and a master of science in aeronautical/astronautical engineering from Purdue University (1969). Covey has served as an operational fighter pilot and weapons test pilot. He was chosen with the eighth group of astronauts in 1978 and provided astronaut support in orbiter engineering development and testing. He was the pilot of STS 51-I and STS-26, the first flight after the Challenger accident.

John Oliver Creighton; Captain, USN; born April 28, 1943, Orange, Texas; married. **Spaceflight:** STS 51-G

Received bachelor of science from U.S. Naval Academy (1966) and master of science in Administration of Science and Technology from George Washington University (1978). Creighton served two combat tours in Vietnam and then attended the U.S. Naval Test Pilot School. He was a test pilot, and later served as an operational fighter pilot (F-14) and operations officer at the Naval Air Test Center's Strike Directorate. Creighton was chosen with the eighth group of astronauts in 1978 and was the pilot of STS 51-G. He is currently training to be the commander of STS-36, a Department of Defense mission.

Robert Laurel Crippen; Captain, USN; born September 11, 1937, Beaumont, Texas; married, three children (by a previous marriage). **Spaceflights:** STS-1, STS-7, STS 41-C, STS 41-G

Received bachelor of science degree in aerospace engineering from the University of Texas (1960), was selected for the MOL program in 1966, and transferred to the NASA astronaut program in 1969. He was commander of the Skylab Medical Experiments Altitude Test and was part of the support crew for Skylab 2,3, and 4, and the Apollo-Soyuz Test Project. In April 1981, Crippen piloted the first orbital flight test of the shuttle Columbia (STS-1). He also was the commander of STS-7, STS 41-C and STS 41-G. Following retirement from the astronaut corps, Crippen served as the Deputy Director of the Flight Crew Operations Directorate at Johnson Space Center. He is currently the Deputy Director of NSTS Operations at NASA Headquarters, stationed at Kennedy Space Center, Florida.

Frank L. Culbertson; Commander, USN; born May 15, 1949, Charleston, South Carolina; married, three children (by a previous marriage).

Received bachelor of science in aerospace engineering from the U.S. Naval Academy (1971). Culbertson has served tours as an F–4 pilot in Japan and Arizona and graduated from U.S. Navy Test Pilot School. Following test pilot school he served as the program manager for all F–4 testing at the Naval Strike Aircraft Test Directorate. In 1984, he was serving as a naval aviator at the Naval Air Station Oceana in Virginia, when he was selected as an astronaut. Culbertson is now awaiting a flight assignment as a pilot.

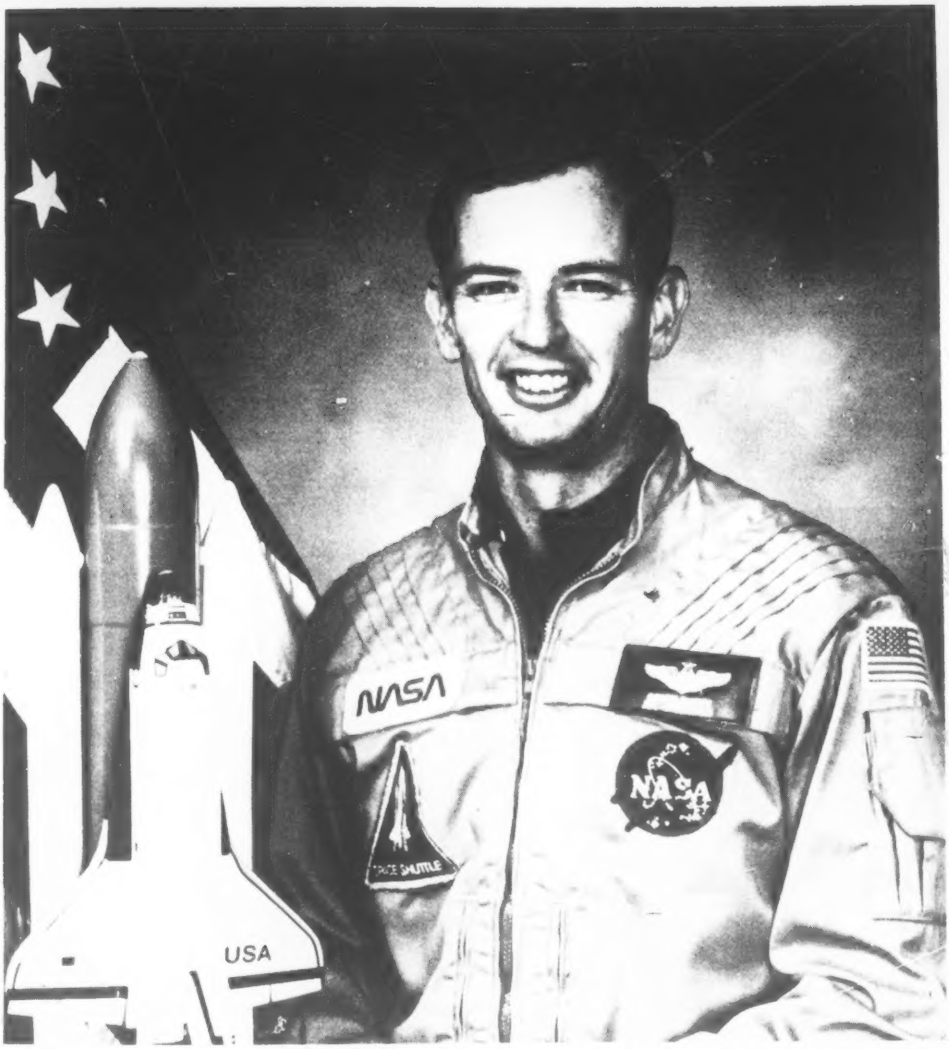
Ronnie Walter Cunningham; civilian; born March 16, 1932, Creston, Iowa; married, two children. **Spaceflight: Apollo 7**

Flew as an aviator in the U.S. Marine Corps, received bachelor of arts degree in physics from the University of California at Los Angeles (1960), master of arts in physics from UCLA (1961), and was chosen with the third group of astronauts in 1963. He was lunar module pilot on Apollo 7. Mr. Cunningham resigned from NASA in August 1971 to become President of the HydroTech Development Company in Houston. He was Senior Vice-President/Director of Engineering, 3D International, Houston, Texas from December 1976 to October 1979. He is currently a partner with the Capital Group in Houston. His book, *The All-American Boys,* offers his views on the astronaut program.

NASA
JAN DAVIS
NASA

N. Jan Davis; Ph.D.; born November 1, 1953, Cocoa Beach, Florida; married.

Received bachelor of science degrees in applied biology from the Georgia Institute of Technology (1975) and mechanical engineering from Auburn University (1977), master of science and a doctorate in mechanical engineering from University of Alabama-Huntsville (1983 and 1985, respectively). Dr. Davis joined NASA's Marshall Space Flight Center as an aerospace engineer in 1979. She has been the team leader of structural analysis for the Hubble Space Telescope and Advanced X-Ray Astrophysics Facility, and the lead engineer for the redesign of the solid rocket booster external tank attach ring. She holds one patent and has written several technical papers. Selected as an astronaut in 1987, she is awaiting assignment as a mission specialist on a future Space Shuttle flight. She is currently training to become an operator of the Remote Manipulator System mechanical arm, and serves as the astronaut office alternate to the Johnson Space Center Payload Safety Panel.



Brian Duffy; Major, USAF; born June 20, 1953, Boston, Massachusetts; married, two children.

Received bachelor of science degree in mathematics from the U.S. Air Force Academy (1975) and master of science in systems management from the University of Southern California (1981). Duffy attended the U.S. Air Force Test Pilot School in 1982 and after graduation, served as the Director of F-15 Tests at Eglin Air Force Base Florida. He was selected as an astronaut in 1985 and is awaiting assignment to a shuttle mission. While at NASA, he has participated in the development and testing of Space Shuttle software and served as the technical assistant to the director of flight crew operations. In addition to training for future flights, Duffy represents the astronaut office in all matters concerning the ascent phase of flight.

Charles Moss Duke, Jr.; Brigadier General, USAFR; born October 3, 1935, Charlotte, North Carolina; married, two children. **Spaceflight: Apollo 16**

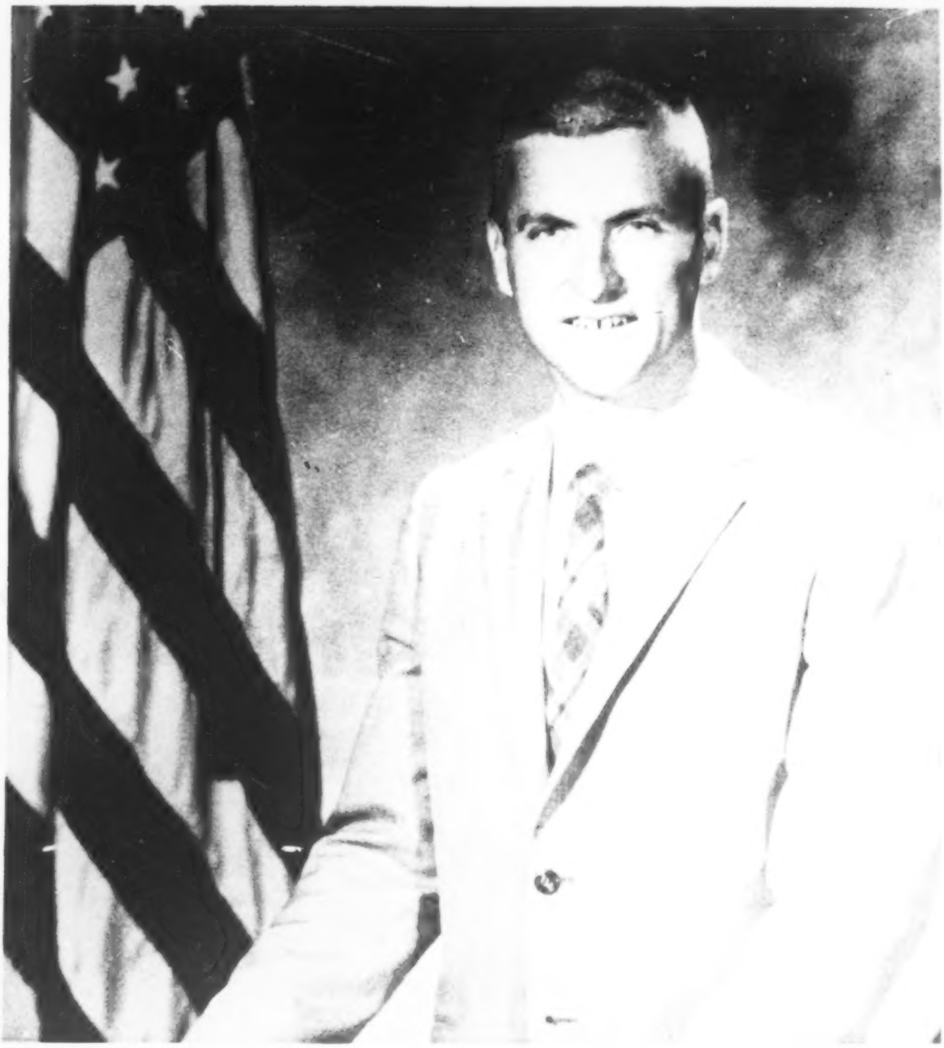
Received bachelor of science from the U.S. Naval Academy (1957), master of science in aeronautics and astronautics from the Massachusetts Institute of Technology (1964), and was chosen with the fifth group of astronauts in 1966. He was backup lunar module pilot on Apollo 13, lunar module pilot for Apollo 16 (tenth man to walk on the Moon), and backup lunar module pilot for Apollo 17. He resigned from NASA and the Air Force (active duty) on January 1, 1976, to become a beer distributor in San Antonio, Texas. He resigned from that position on March 31, 1978, to enter private business in San Antonio. He has since sold his business and currently devotes most of his time to speaking and counseling as a Christian Lay Minister. He has founded a non-profit corporation called the Duke Ministry for Christ.

Bonnie Jeanne Dunbar; civilian; born March 3, 1949, Sunnyside, Washington; married. **Spaceflight: STS 61-A**

Received bachelor of science (1971) and master of science (1975) in ceramic engineering from the University of Washington. She has worked as a systems analyst for Boeing Computer Services, a research engineer at Rockwell International Space Division, a payload officer/flight controller at the Lyndon B. Johnson Space Center, and as a guidance and navigation officer/flight controller for the Skylab reentry mission in 1979. She was a project officer/payload officer for the space shuttle project and a doctoral candidate in biomedical engineering at the University of Houston when she was chosen as a mission specialist astronaut in 1980. She flew as a mission specialist on STS 61-A, and is now training for her next mission, STS-32, the LDEF retrieval mission.

Donn Fulton Eisele; Colonel, USAF (Retired); born June 23, 1930, Columbus, Ohio; died December 2, 1987 of a heart attack, Tokyo, Japan; was married, five children (four by a previous marriage).
Spaceflight: Apollo 7

Received bachelor of science degree from the U.S. Naval Academy (1952), master of science in astronautics from the Air Force Institute of Technology (1960), and was chosen with the third group of astronauts in 1963. He was command module pilot of Apollo 7 and backup command module pilot for Apollo 10. Colonel Eisele left the astronaut corps in June 1970 to become Technical Assistant (Manned Flight) at NASA's Langley Research Center in Hampton, Virginia. He retired from NASA and the Air Force in July 1972 to become Peace Corps Director in Thailand. He was with the Oppenheimer Co., Inc. investment firm in Ft. Lauderdale, Florida at the time of his death.



Anthony Wayne England; civilian, born May 15, 1942, Indianapolis, Indiana; married, two children. **Spaceflight: STS 51-F**

Received bachelor and master of science degrees in geology and physics from the Massachusetts Institute of Technology (1965), doctorate in earth and planetary sciences from MIT (1970), and was chosen with the sixth group of astronauts in 1967. Dr. England was mission scientist for Apollo 16. He resigned from NASA in August 1972 and was a geophysicist with the U.S. Geological Survey, until June 1979 when he returned to NASA. He flew as a mission specialist on STS 51-F, then resigned again from NASA. He is currently a professor of electrical engineering and computer science at the University of Michigan.

Joe Henry Engle; Brigadier General, USANG, born August 26, 1932, Abilene, Kansas; married, two children. **Spaceflights:** **STS-2, STS 51-I**

Received bachelor of science degree in aeronautical engineering from the University of Kansas (1955), was selected for the X-15 program in June 1963 and made a total of 16 X-15 flights reaching an altitude of 280,600 feet, thereby qualifying for the astronaut title; he was chosen as a NASA astronaut with the fifth group in 1966. He was backup lunar module pilot for Apollo 14 and commander of one of the two crews who flew shuttle approach and landing tests. Engle was the backup commander for the first shuttle orbital flight test, commander of the second orbital flight test of the shuttle (STS-2), and commander of STS 51-I. He served as Deputy Associate Administrator for Manned Space Flight at NASA Headquarters from March to December 1982. Engle is currently the Air National Guard Assistant to the Commander in Chief, U.S. Space Command, and an aerospace and sporting goods consultant.

Ronald Ellwin Evans; Captain, USN (Retired); born November 10, 1933, St. Francis, Kansas; married, two children. **Spaceflight: Apollo 17**

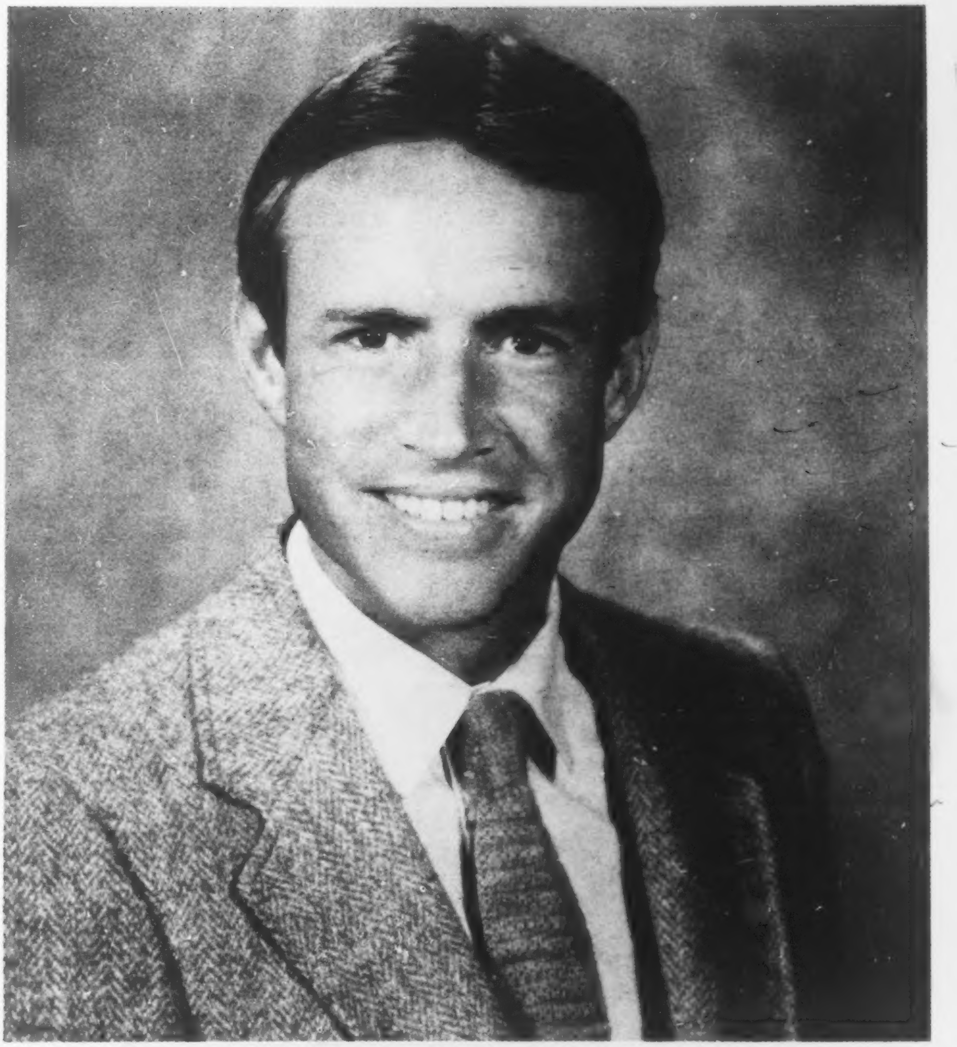
Received bachelor of science in electrical engineering from the University of Kansas (1956), master of science in aeronautical engineering from the U.S. Naval Postgraduate School (1964), and was chosen with the fifth group of astronauts in 1966. Captain Evans was backup command module pilot for Apollo 14, command module pilot for Apollo 17, and was backup command module pilot for the Apollo-Soyuz Test Project. He retired from the Navy on April 30, 1976, and from NASA on March 15, 1977. He was Executive Vice-President of Western America Energy Corporation in Scottsdale, Arizona until 1978 and later Manager, Space Systems Marketing for Sperry Flight Systems, Phoenix, Arizona. Evans is currently a marketing consultant.

John McCreary Fabian; Colonel, USAF (Retired); born January 28, 1939, Goosecreek, Texas; married, two children. **Spaceflights: STS-7, STS 51-G**

Received bachelor of science in mechanical engineering from Washington State University (1962), master of science in aerospace engineering from the Air Force Institute of Technology (1964) and a doctorate in aeronautics/astronautics from the University of Washington (1974). Fabian has served in the Air Force as an aeronautics engineer, KC-135 pilot (flying 90 combat missions) and an assistant professor of aeronautics, U.S. Air Force Academy, Colorado. He was chosen with the eighth group of astronauts in 1978, and worked extensively on satellite deployment and retrieval activities. He was a mission specialist on STS-7 and STS 51-G. Fabian resigned from NASA in 1986, and is currently Vice President for Space Systems at Analytic Services (ANSER) Inc., Arlington, Virginia.

Anna Lee Fisher; civilian; born August 24, 1949, Albany, New York; married (to astronaut William Fisher), two children. **Spaceflight: STS 51-A**

Received bachelor of science in chemistry from the University of California, Los Angeles (1971) and a doctorate of medicine from University of California, Los Angeles, School of Medicine (1976). Fisher was working in emergency medicine when she was chosen with the eighth group of astronauts in 1978. She was a mission specialist on STS 51-A and is currently awaiting future flight assignments.



William Frederick Fisher; civilian; born April 1, 1946, Dallas, Texas; married (to astronaut Anna Fisher), two children. **Spaceflight: STS 51-I**

Received bachelor of arts in pre-med from Stanford University (1968), doctorate in medicine from the University of Florida (1975), and a master of science in engineering from the University of Houston (1980). He was a specialist in emergency medicine and was an instructor at the University of South Florida and at Northeast Regional Medical Center in Anniston, Alabama when chosen as a mission specialist astronaut in 1980. Fisher flew as a mission specialist on STS 51-I, and is currently practicing emergency medicine at Clear Lake Hospital, Houston, Texas, and awaiting future flight assignments.

C. Michael Foale; Ph.D.; born January 6, 1957, Louth, England; married.

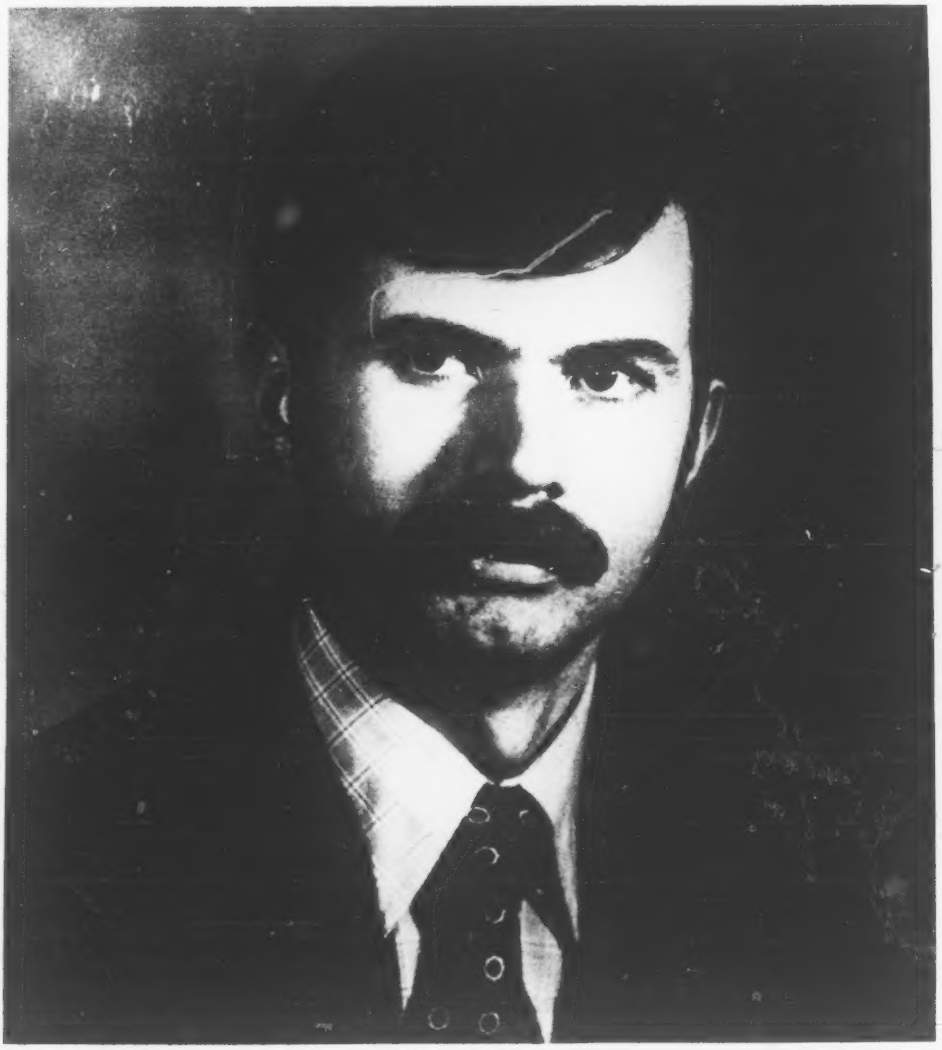
Received bachelor of arts degree in physics from the University of Cambridge, Queens College (1978) and doctorate in laboratory astrophysics from the University of Cambridge (1982). Foale joined the NASA Johnson Space Center in 1983 and was a payload officer in the Mission Control Center for shuttle missions STS 51-G, 51-I, 61-B, and 61-C. He was selected as an astronaut in June 1987 and is awaiting assignment as a mission specialist. Foale is currently working on verifying Space Shuttle flight software.

Theodore Cordy Freeman; Captain, USAF; born February 18, 1930, Haverford, Pennsylvania; died October 31, 1964, in a T–38 crash at Ellington Air Force Base, Texas; was married, one child.

Received bachelor of science degree from the U.S. Naval Academy (1953), master of science in aeronautical engineering from the University of Michigan (1960), and was chosen with the third group of astronauts in 1963.

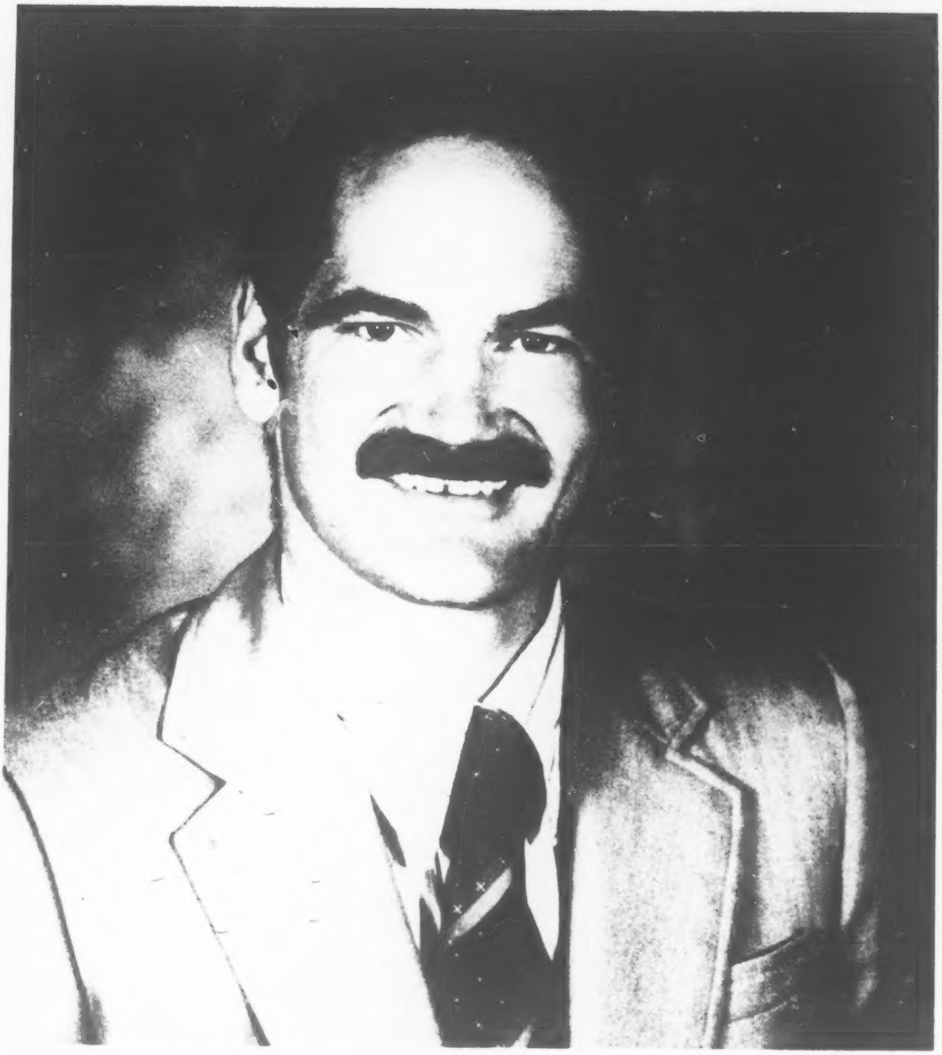
Charles Gordon Fullerton; Colonel, USAF; born October 11, 1936, Rochester, New York; married, two children. **Spaceflights: STS-3, STS 51-F**

Received bachelor of science in mechanical engineering from the California Institute of Technology (1957), master of science in mechanical engineering from CalTech (1958), was selected for the MOL program in 1966, and transferred to the NASA astronaut program in 1969. He was a member of one of the two-man crews who flew shuttle approach and landing tests; was the pilot on the STS-3 mission; and the commander of the STS 51-F mission. Fullerton resigned from the astronaut corps and is currently a research pilot at NASA Dryden Flight Research Facility.



Dale Allen Gardner; Commander, USN; born November 8, 1948, Fairmont, Minnesota; married, two children. **Spaceflights: STS-8, STS 51-A**

Received bachelor of science in engineering physics from the University of Illinois (1970). Gardner has served in a number of assignments during his Navy career including project officer for testing F-14 guidance systems, operational fighter pilot and test pilot. Gardner was selected as an astronaut in 1978. He was a mission specialist on STS-8 and on STS 51-A. Gardner resigned from NASA and is currently assigned to the U.S. Space Command in Colorado Springs, Colorado.



Guy Spence Gardner; Lieutenant Colonel, USAF; born January 6, 1948, Alta Vista, Virginia; married, three children. **Spaceflight: STS-27**

Received bachelor of science in engineering sciences from U.S. Air Force Academy (1969); and a master of science in aeronautics and astronautics from Purdue University (1970). Graduated from the USAF Test Pilot School at Edwards Air Force Base, California in 1975, served as a test pilot at Edwards, and was an instructor pilot at the USAF Test Pilot School. He was an operations officer with the 1st Test Squadron at Clark Air Base, Philippines, when chosen as a pilot astronaut in 1980. Gardner was the pilot of STS-27 and is currently training to serve as the pilot of STS-35, the ASTRO-1 mission.

Owen Kay Garriott; civilian; born November 22, 1930, Enid, Oklahoma; married, four children (by a previous marriage). **Spaceflights: Skylab 3, STS-9**

Received bachelor of science degree in electrical engineering from the University of Oklahoma (1953), master of science in electrical engineering from Stanford University (1957), doctorate in electrical engineering from Stanford (1960), and was chosen with the fourth group of astronauts in 1965. He was science pilot for Skylab 3, and a mission specialist on STS-9 (Spacelab 1). He served as the Program Scientist for the Space Station Program Office at Johnson Space Center prior to his retirement from NASA. Garriott is currently the Vice President of Space Programs at Teledyne Brown Engineering.

Charles "Sam" D. Gemar; Captain, USA; born August 4, 1955, Yankton, South Dakota; married.

Received bachelor of science degree in mechanical engineering from the U.S. Military Academy (1979). Gemar has experience in the U.S. Army infantry, both as an paratrooper and as a helicopter pilot. He has attended numerous Army command and tactical schools. Gemar, a member of the 1985 class of astronauts, is awaiting assignment as a mission specialist on future Space Shuttle flights.

Edward George Gibson; civilian; born November 8, 1936, Buffalo, New York; married, four children. **Spaceflight: Skylab** 4

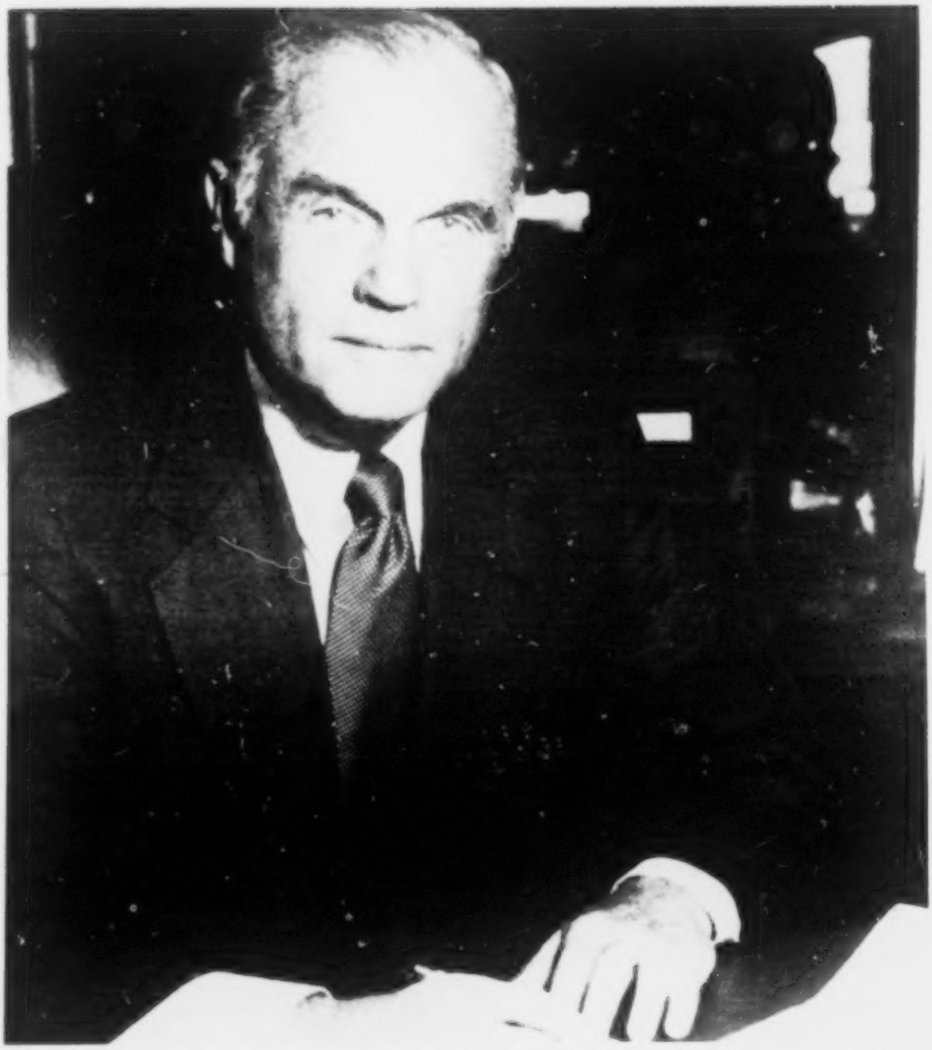
Received bachelor of science degree in engineering from the University of Rochester (1959), master of science and engineering from the California Institute of Technology (1960), doctorate in engineering from CalTech (1964), and was chosen with the fourth group of astronauts in 1965. He was science pilot for Skylab 4. Dr. Gibson resigned from NASA in November 1974 to join the Aerospace Corporation as senior staff scientist. He then became a senior consultant for Spacelab operations at VFW Fokker/ERNO in Europe. In March 1977, Dr. Gibson rejoined NASA, but resigned again in October 1980 to work for TRW. He is currently with Booz, Allen and Hamilton in Bethesda, Maryland.

Robert "Hoot" Lee Gibson: Commander, USN; born October 30, 1946, Cooperstown, New York; married (to astronaut Rhea Seddon), three children (one by a previous marriage). **Spaceflights: STS 41-B, STS 61-C, STS-27**

Received bachelor of science in aeronautical engineering from California Polytechnic State University (1969). Gibson entered active duty with the Navy in 1969 and, after flight training, flew combat missions in Southeast Asia. He returned to the U.S. as a F-14 instructor pilot and later attended the U.S. Naval Test Pilot School and the Naval Fighter Weapons School ("Top Gun"). He was chosen with the eighth group of astronauts in 1978 and was the pilot on STS 41-B and commander of STS 61-C and STS-27.

Edward Galen Givens, Jr.; Major, USAF; born January 5, 1930, Quanah, Texas; died June 6, 1967, in an automobile accident near Houston, Texas; was married, two children.

Received bachelor of science degree from the U.S. Naval Academy (1952) and was chosen with the fifth group of astronauts in 1966.



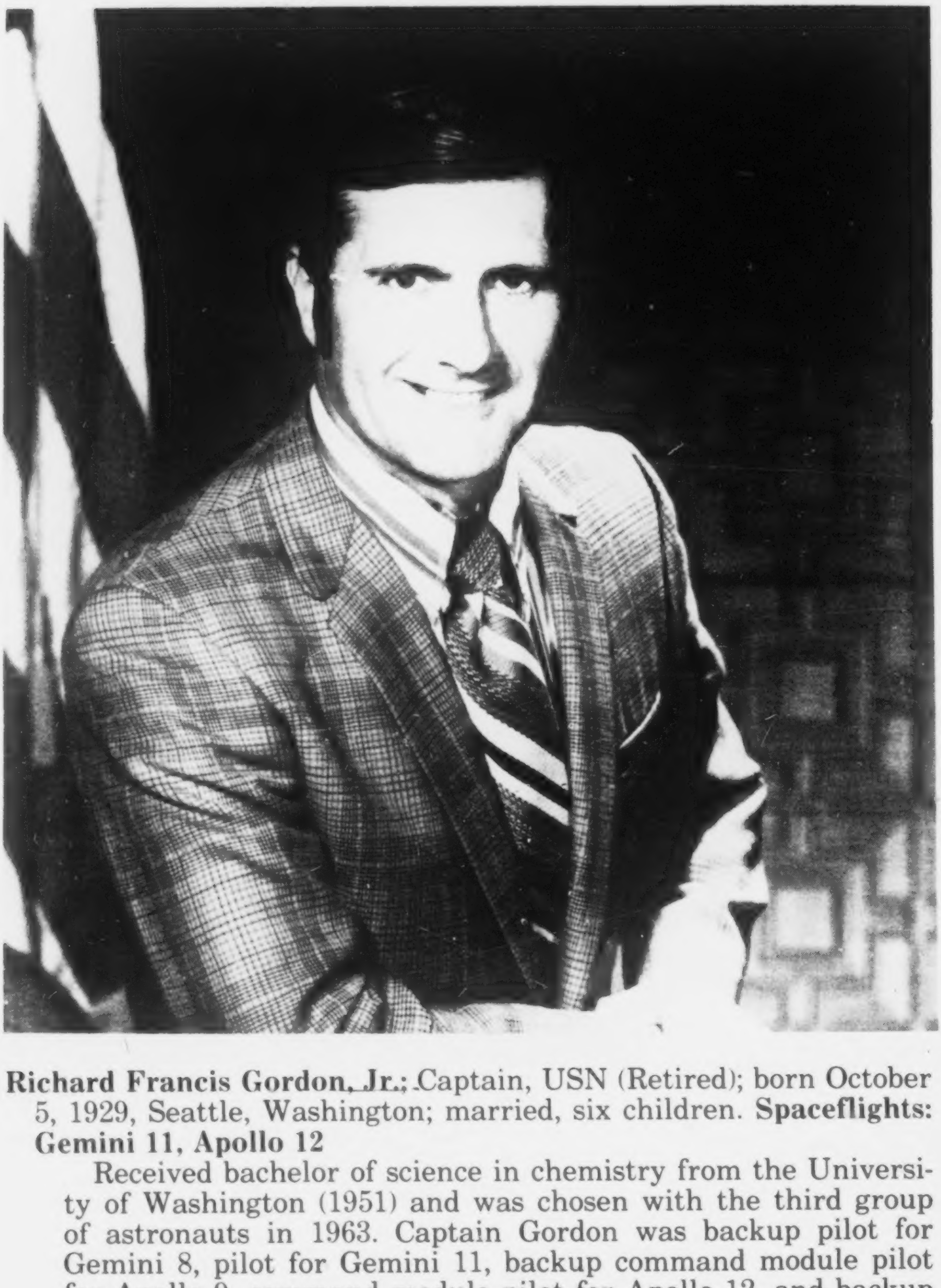
John Herschel Glenn, Jr.; Colonel, USMC (Retired); born July 18, 1921, Cambridge, Ohio; married, two children. **Spaceflight: Mercury-Atlas 6**

Attended Muskingum College, entered Naval Aviation Cadet Program (1942), commissioned in the Marine Corps (1943) and was chosen with the first group of astronauts in 1959. He was backup pilot for Mercury-Redstone 3 (Freedom 7) and Mercury-Redstone 4 (Liberty Bell 7), and was the first American to make an orbital flight, in Mercury-Atlas 6 (Friendship 7). He retired from NASA and the Marine Corps in 1964 to join the Royal Crown Cola Company, and to enter politics. He was elected U.S. Senator from the State of Ohio in November 1974 and was re-elected in 1980 and again in 1986.

NASA
NASA
LINDA GODWIN
JSC - HOUSTON
NASA
USA

Linda M. Godwin; Ph.D.; born July 2, 1952, Cape Girardeau, Missouri, single.

Received bachelor of science degree in mathematics and physics from Southeast Missouri State University (1974) and a master of science and doctorate from the University of Missouri (1976 and 1978). Dr. Godwin joined NASA in 1980 and has worked on payload integration (attached payloads and Spacelab), and as a flight controller and payloads officer on several Shuttle missions. She was selected as an astronaut in 1985 and is currently training to serve as a mission specialist on STS-37, which will deploy the Gamma Ray Observatory.

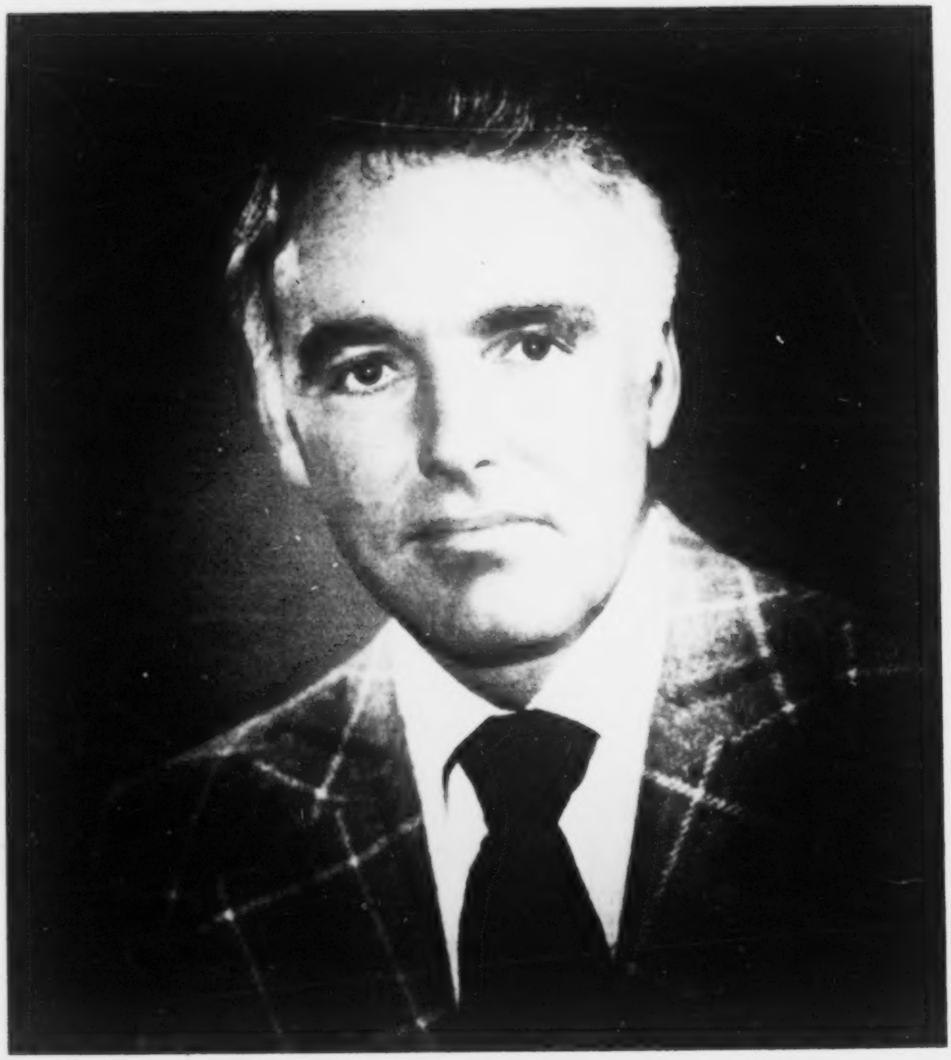


Richard Francis Gordon, Jr.; Captain, USN (Retired); born October 5, 1929, Seattle, Washington; married, six children. **Spaceflights: Gemini 11, Apollo 12**

Received bachelor of science in chemistry from the University of Washington (1951) and was chosen with the third group of astronauts in 1963. Captain Gordon was backup pilot for Gemini 8, pilot for Gemini 11, backup command module pilot for Apollo 9, command module pilot for Apollo 12, and backup commander for Apollo 15. He retired from NASA and the Navy on January 1, 1972, to become Executive Vice-President of the New Orleans Saints of the National Football League, a position he resigned on April 1, 1977. He was Vice-President, Operations, at Scott Science and Technology, Inc., and is currently working with Astro Systems and Engineering in Los Angeles.

Ronald John Grabe; Colonel, USAF; born June 13, 1945, New York, New York; married, two children. **Spaceflights: STS 51-J, STS-30**

Received bachelor of science in engineering science from U.S. Air Force Academy (1966) and studied aeronautics as a Fulbright Scholar at the Technische Hochschule, Darmstadt, West Germany (1967). He was a pilot in Vietnam, graduated from the USAF Test Pilot School in 1975, was a test pilot at the Air Force Flight Test Center, and was an instructor at the USAF Test Pilot School at Edwards Air Force Base, California, when chosen as a pilot astronaut in 1980. He has also served as Deputy Manager for Operations Integration, Space Shuttle Program Office. He flew as the pilot of STS 51-J and of STS-30.

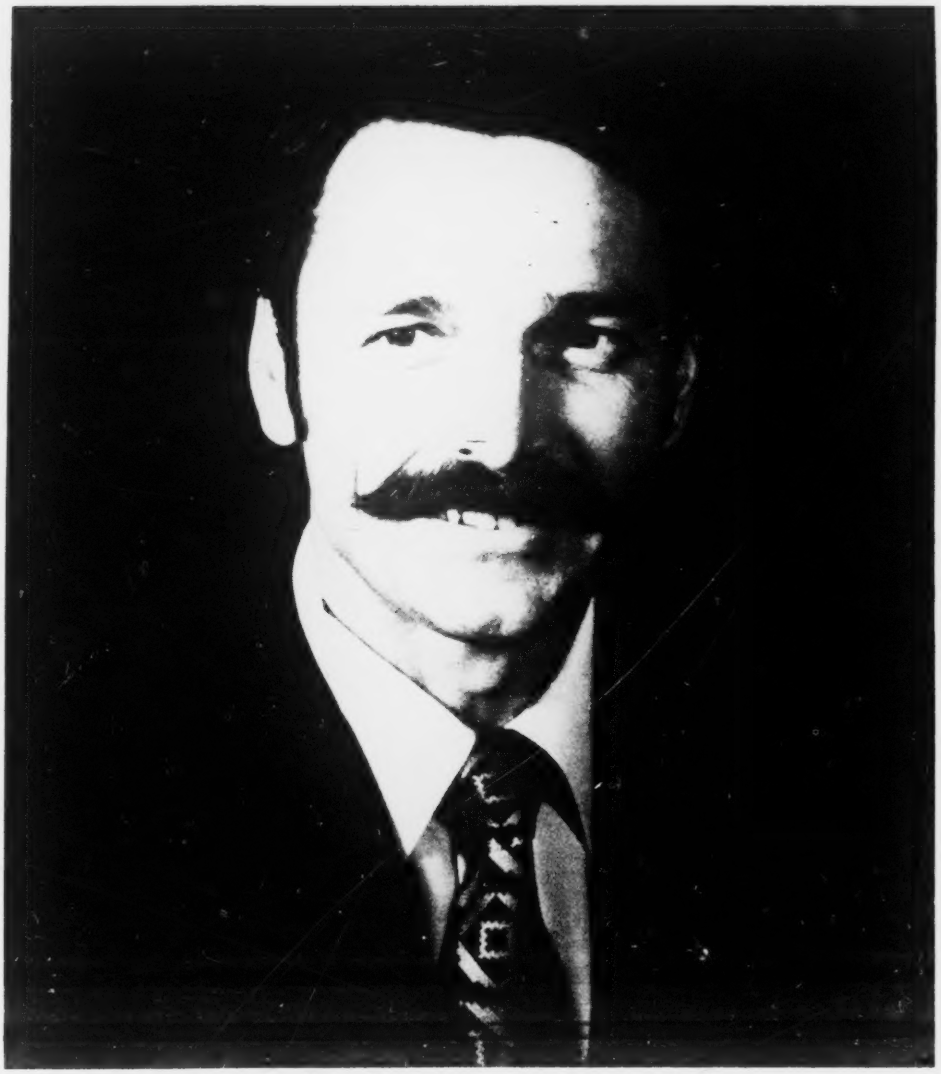


Duane Edgar Graveline; civilian; born March 2, 1931, Newport, Vermont; married, five children.

Received bachelor of science degree from the University of Vermont Medical School (1955), master of science in public health from Johns Hopkins University (1958), served in the U.S. Air Force, and was chosen with the fourth group of astronauts in 1965. Dr. Graveline resigned from NASA in August 1965 for personal reasons and took a position with the State of Vermont Department of Health. He later resigned that position and set up his own practice, the Health Maintenance Center, in Colchester, Vermont.

Frederick Drew Gregory; Colonel, USAF; born January 7, 1941, Washington, D.C.; married, two children. **Spaceflight: STS 51-B**

Received bachelor of science from U.S. Air Force Academy (1964), and master of science in information systems from George Washington University (1977). Gregory has served as both a helicopter and fighter pilot. He attended the U.S. Navy Test Pilot School and was a research/engineering test pilot for both the Air Force and NASA prior to being named an astronaut in 1978. Gregory was the pilot of STS 51-B (Spacelab 3) and is now training to be the commander of STS-33, a Department of Defense mission.



Stanley "Dave" David Griggs; Rear Admiral, USNR; born September 7, 1939, Portland, Oregon; died, June 17, 1989, in a private aircraft accident; was married, two children. **Spaceflight: STS 51-D**

Received bachelor of science from U.S. Naval Academy (1962); received master of science administration in management engineering from George Washington University (1970); served as a naval aviator; and was a test pilot at the Naval Air Test Center, Patuxent River, Maryland. He resigned his regular U.S. Navy Commission in 1970 and joined the Naval Air Reserve, rising to the rank of Rear Admiral. He was Chief of the Shuttle Training Aircraft Operations Office, Johnson Space Center, when he was chosen with the eighth group of astronauts in 1978. He flew as a mission specialist on STS 51-D. Griggs was assigned to pilot STS-33 at the time of his death.

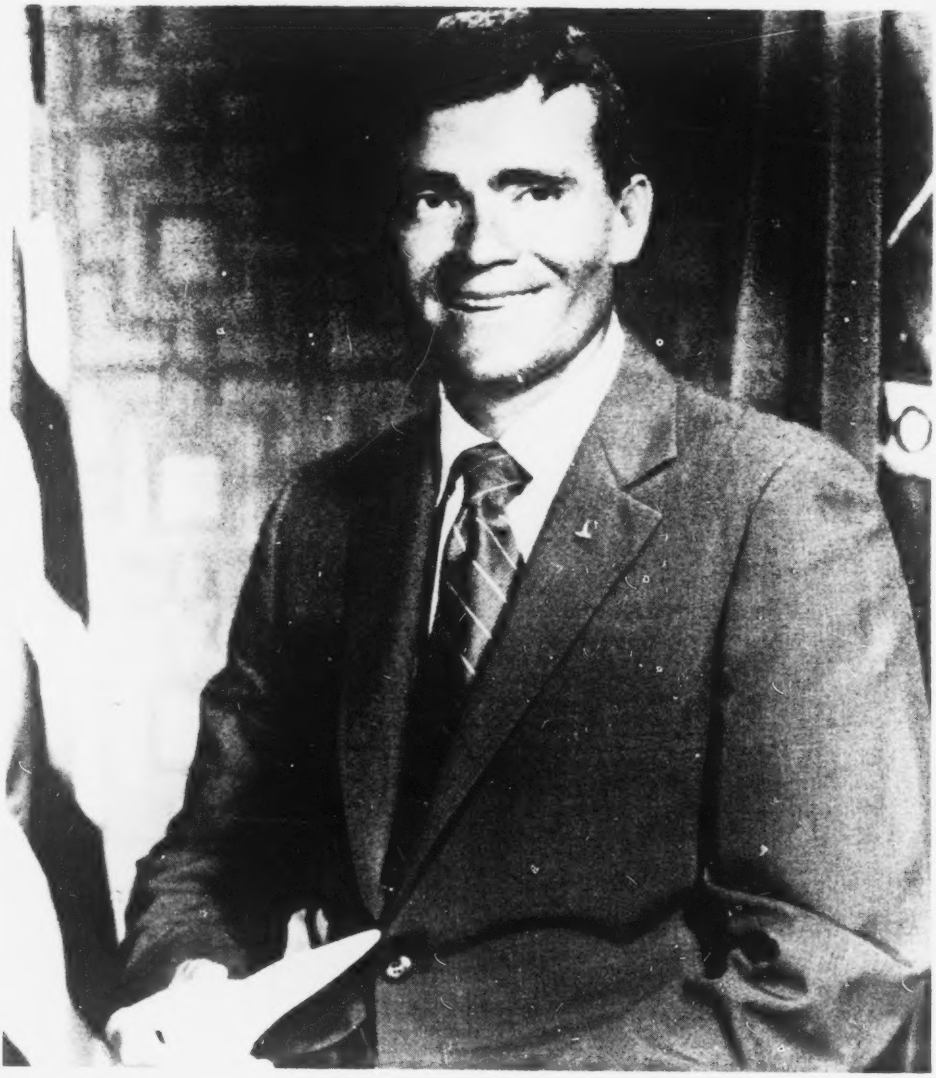
Virgil "Gus" Ivan Grissom: Lieutenant Colonel, USAF; born April 3, 1926, Mitchell, Indiana; died January 27, 1967, in the Apollo 204 fire at Cape Kennedy, Florida; was married, two children.
Spaceflights: Mercury-Redstone 4, Gemini 3

Received bachelor of science in mechanical engineering from Purdue University (1950) and was chosen with the first group of astronauts in 1959. He was pilot for Mercury-Redstone 4 (Liberty Bell 7), command pilot for Gemini 3, backup command pilot for Gemini 6, and had been selected as commander of the first Apollo flight.

NASA
USA
SPACE SHUTTLE
NASA

Sidney M. Gutierrez; Major, USAF; born June 27, 1951, Albuquerque, New Mexico; married, two children.

Received bachelor of science in aeronautical engineering, U.S. Air Force Academy (1973), and master of arts in management, Webster College (1977). After graduation from the Air Force Academy, Gutierrez became a T–38 instructor pilot. He attended the U.S. Air Force Test Pilot School in 1981, and served as a test pilot on the F–15 and F–16. Gutierrez also maintains a Master Parachutist rating. He was selected as an astronaut in 1984 and is currently awaiting a specific flight assignment and working on software verification and development.



Fred Wallace Haise, Jr.; civilian; born November 14, 1933, Biloxi, Mississippi; married, four children (by a previous marriage). **Spaceflight: Apollo 13**

Received bachelor of science degree in aeronautical engineering from the University of Oklahoma (1959), served as an aviator in both the U.S. Marine Corps and the U.S. Air Force, and was chosen in the fifth group of astronauts in 1966. Mr. Haise was backup lunar module pilot for Apollo 8 and Apollo 11, lunar module pilot for Apollo 13, and backup commander for Apollo 16. He was commander of one of the two crews who flew shuttle approach and landing test. He had been selected as commander of one of the four shuttle orbital flight tests, but resigned from NASA on June 29, 1979 and is currently President, Grumman Space Station Program Support Company.

NASA
NASA
BLAINE HAMMOND
JSC HOUSTON
NASA
USA

L. Blaine Hammond, Jr.; Major, USAF; born January 16, 1952, Savannah, Georgia; married.

Received bachelor of science, U.S. Air Force Academy (1973) and master of science in engineering mechanics, Georgia Institute of Technology (1974). Hammond has managed several flight test projects and was a test pilot instructor for the Air Force until selected as an astronaut in 1984. He is currently awaiting a specific flight assignment.

NASA
GREG HARBAUGH
J.S.C. HOUSTON
NASA

Gregory J. Harbaugh; civilian; born April 15, 1956, Cleveland, Ohio; married, one child.

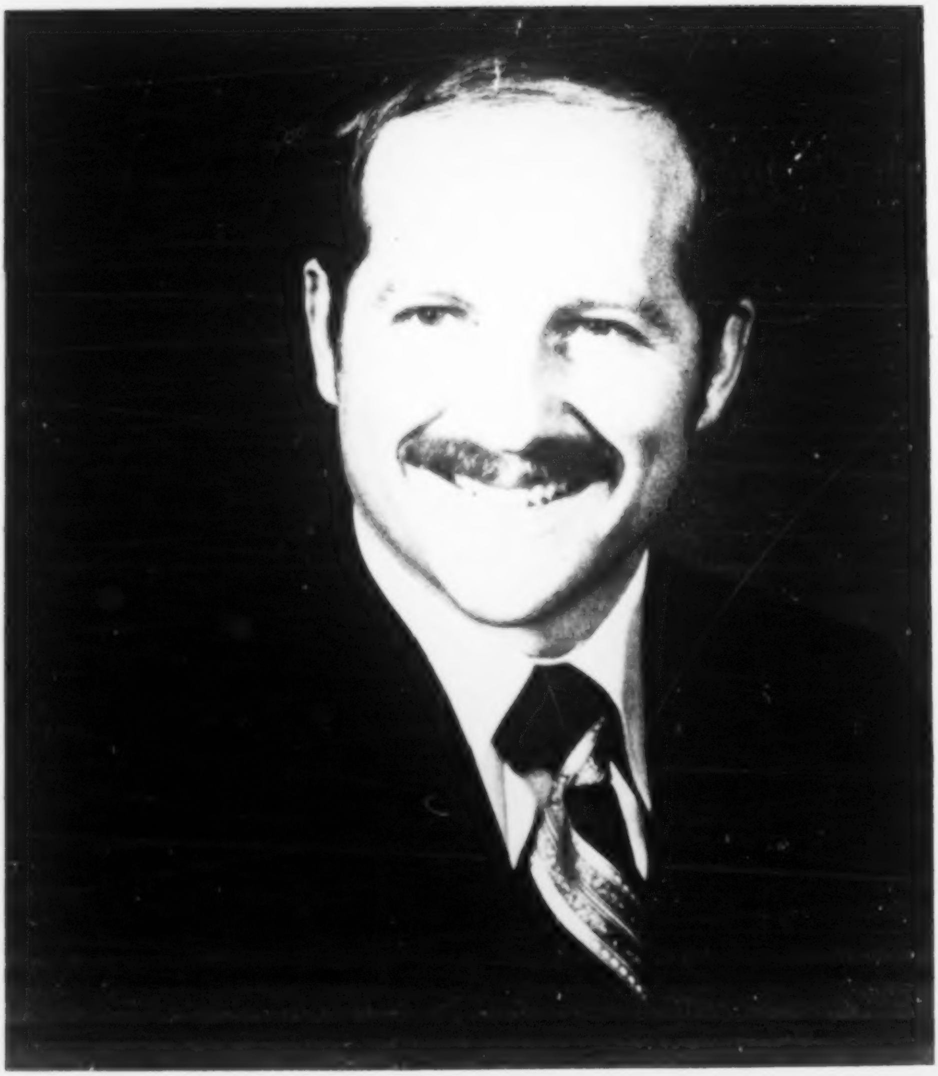
Received bachelor of science in aeronautical and astronautical engineering from Purdue University (1978) and master of science in physical science from the University of Houston-Clear Lake (1986). Harbaugh joined Johnson Space Center in 1978 and has held various engineering and technical management positions in the area of flight operations. After the *Challenger* accident, he led a team of engineers who analyzed the schedule and workload conditions at JSC. Harbaugh was selected as an astronaut in 1987 and is participating in evaluations of RMS/EVA techniques and hardware for future missions while awaiting assignment to a specific shuttle mission.

Terry Jonathan Hart; civilian; born October 27, 1946, Pittsburgh, Pennsylvania; married, one child. **Spaceflight: STS 41-C**

Received bachelor of science in mechanical engineering from Lehigh University (1968); master of science in mechanical engineering from Massachusetts Institute of Technology (1969); master of science in electrical engineering Rutgers University (1978); served in the USAF as an aviator; and was chosen with the eighth group of astronauts in 1978. He flew as a mission specialist on STS 41-C. Hart resigned from NASA in June 1984 and is currently a supervisor for the Military and Space Application Group at AT&T Bell Labs.

Henry Warren Hartsfield, Jr.; Colonel, USAF (Retired); born November 21, 1933, Birmingham, Alabama; married, two children.
Spaceflights: STS-4, STS 41-D, STS 61-A

Received bachelor of science degree in physics from Auburn University (1954), master of science in engineering science from the University of Tennessee (1971), was selected for the MOL program in 1966 and transferred to the NASA astronaut program in 1969. Col. Hartsfield was a member of the support crew for Skylab 2, 3, and 4. He retired from the Air Force on Aug. 31, 1977. He was the pilot for the STS-4 flight and commander of STS 41-D and STS 61-A. He is awaiting future flight assignments.



Frederick "Rick" Hamilton Hauck; Captain, USN; born April 11, 1941, Long Beach, California; married, two children. **Spaceflights: STS-7, STS 51-A, STS-26**

Received bachelor of science in general physics from Tufts University (1962); master of science in nuclear engineering from Massachusetts Institute of Technology (1966). Hauck has served in the Navy as a communications officer, pilot, instructor, test pilot and operations officer. He was chosen with the eighth group of astronauts in 1978. Hauck was pilot for the STS-7 flight and commander of STS 51-A and STS-26, the first flight after the *Challenger* accident. He resigned from NASA in 1989 and was named Director of the U.S. Navy Space and Naval Warfare Command.

Steven Alan Hawley; civilian; born December 12, 1951, Ottawa, Kansas, divorced. **Spaceflights: STS 41-D, STS 61-C**

Received bachelor of arts in astronomy and physics from the University of Kansas (1973) and a doctorate in astronomy from the University of California, Santa Cruz (1977). During his graduate work, Hawley spent three summers employed as a research assistant at the U.S. Naval Observatory and the National Radio Astronomy Observatory. He was selected as an astronaut in 1978, and flew on STS 41-D and STS 61-C. Hawley is now training as a mission specialist for STS-31, which will deploy the Hubble Space Telescope.

Karl Gordon Henize; civilian; born October 17, 1926, Cincinnati, Ohio; married, four children. **Spaceflight: STS 51-F**

Received bachelor of arts degree in math from the University of Virginia (1947), master of arts in astronomy from the University of Virginia (1948), a doctorate in astronomy from the University of Michigan (1954), served in the U.S. Naval Reserve, and was chosen in the sixth group of astronauts in 1967. He was a principal investigator for ultraviolet astronomy experiments for the Skylab program, a member of the support crew for Skylab 2, 3, and 4, and flew as a mission specialist on STS 51-F (Spacelab 2). He has resigned from the astronaut corps and is currently a senior scientist in space physics at the Johnson Space Center.

Terence T. Henricks; Lieutenant Colonel, USAF; born July 5, 1952, Bryan, Ohio; married, three children.

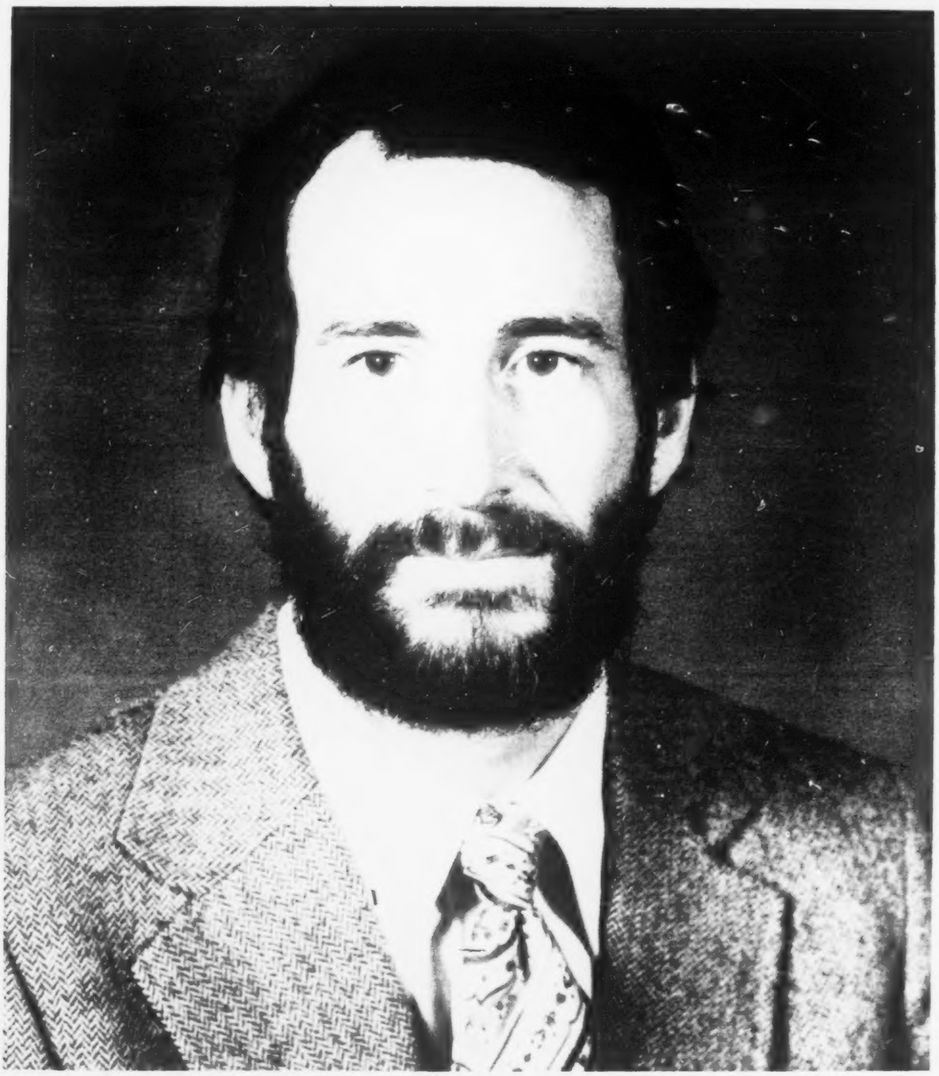
Received bachelor of science in civil engineering from the U.S. Air Force Academy (1974) and a master's degree in public administration from Golden Gate University (1982). Henricks, an Air Force pilot, has attended the USAF Test Pilot School (1983), and prior to being selected as an astronaut in 1985, was an F-16 test pilot at Edwards AFB, California. Henricks also holds a Master Parachutist rating, with over 700 parachute jumps. After becoming an astronaut, Henricks worked on re-evaluating Shuttle landing sites worldwide; he is currently the assistant manager for integration in the NSTS program office at Johnson Space Center, and is awaiting a flight assignment.

Richard J. Hieb; civilian; born September 21, 1955, Jamestown, North Dakota; married, one child.

Received bachelor of arts in math and physics from Northwest Nazarene College (1977) and a master of science in aerospace engineering from the University of Colorado (1979). Hieb joined NASA after graduation from the University of Colorado; he has an extensive background in on-orbit procedures, particularly in rendezvous and proximity operations. Hieb was selected as an astronaut in 1985 and is currently awaiting a flight assignment as a mission specialist and is working on mission development of STS-39.

David Carl Hilmers; Lieutenant Colonel, USMC; born January 28, 1950, Clinton, Iowa; married, two children. **Spaceflights: STS 51-J, STS-26**

Received bachelor of science in mathematics from Cornell College (1972); master of science in electrical engineering (1977) and the degree of electrical engineer from the U.S. Naval Postgraduate School (1978). Hilmers served as a bombardier-navigator and air liaison officer prior to attending the Naval Postgraduate School. Hilmers was selected as an astronaut in 1980 and flew as a mission specialist on STS 51-J and STS-26. Hilmers is currently training for his next flight, STS-36, a Department of Defense mission.

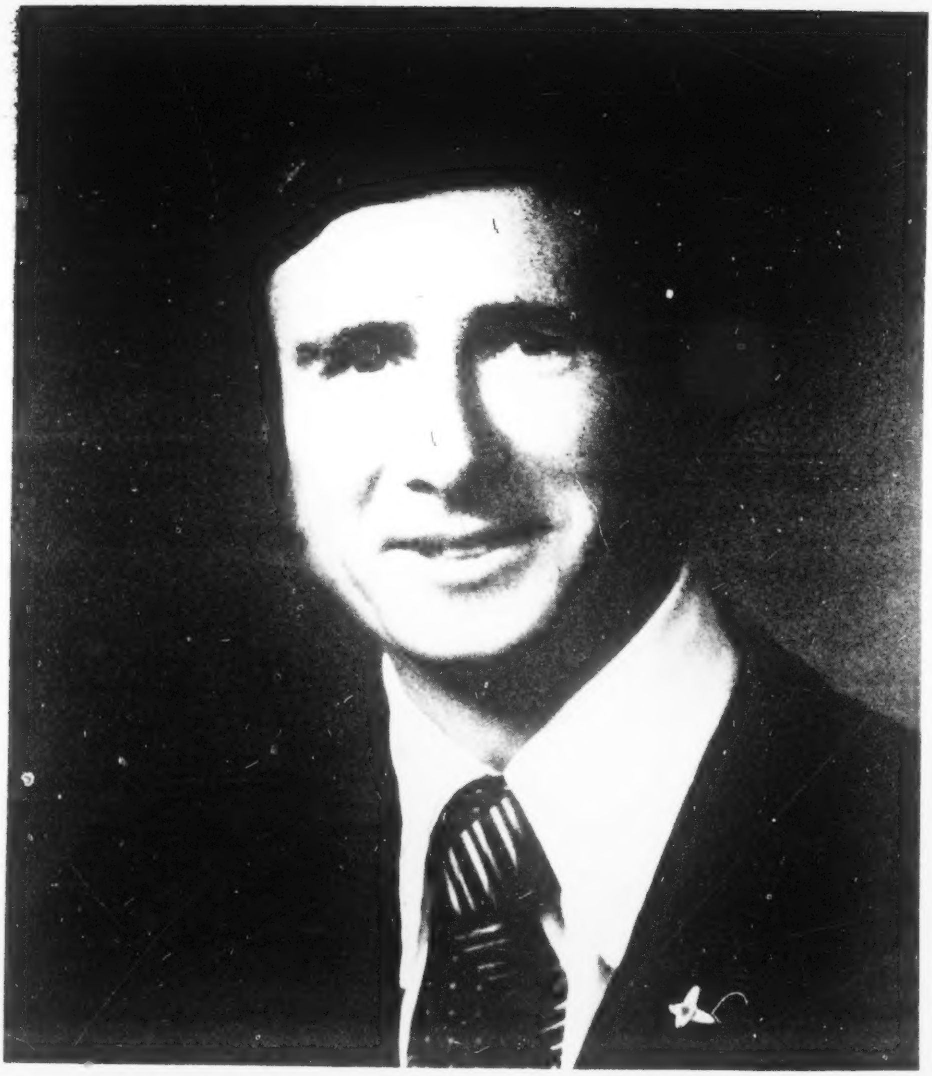


Jeffrey Alan Hoffman; civilian; born November 2, 1944, New York, New York; married, two children. **Spaceflight: STS 51-D**

Received bachelor of arts in astronomy from Amherst College (1966) and a doctorate in astrophysics from Harvard University (1971). Dr. Hoffman was involved in research activities when chosen with the eighth group of astronauts in 1978. He flew as a mission specialist on STS 51-D, and is now training as a mission specialist for STS-35, the ASTRO-1 mission.

Donald Lee Holmquest; civilian; born April 7, 1939, Dallas Texas; married, one child (by a previous marriage).

Received bachelor of science in electrical engineering from Southern Methodist University (1963), doctor of medicine degree from Baylor University College of Medicine (1967), doctorate in physiology from Baylor (1968), and was chosen in the sixth group of astronauts in 1967. He later received his juris doctorate from the University of Houston. Dr. Holmquest took a leave of absence in May 1971 to become an assistant professor of radiology and physiology at Baylor College of Medicine. He resigned from NASA in September 1973 to become Associate Dean of the Medical School at Texas A&M University, and was later the head of the Nuclear Medicine Department, Navasota Medical Center, Navasota, Texas. He is currently a partner in the Houston law firm of Wood, Lucksinger and Epstein.



James Benson Irwin; Colonel, USAF (Retired); born March 17, 1930, Pittsburgh, Pennsylvania; married, four children. **Spaceflight: Apollo 15**

Received bachelor of science from the U.S. Naval Academy (1951), master of science in aeronautical and instrumentation engineering from the University of Michigan (1957), and was chosen with the fifth group of astronauts in 1966. He was backup lunar module flight pilot for Apollo 12 and lunar module pilot for Apollo 15 (eighth man to walk on the Moon). Colonel Irwin resigned from NASA and the Air Force on July 1972 to form a religious organization, High Flight Foundation, in Colorado Springs, Colorado. He is Chairman of the Board. His book, *To Rule the Night,* describes his early life, selection into the astronaut program, and his experiences on Apollo 15.

Marsha S. Ivins; civilian; born April 15, 1951, Baltimore, Maryland; single.

Received bachelor of science in aerospace engineering from University of Colorado (1973). She has been employed at Johnson Space Center since 1974 as an engineer and since 1980 has worked on flight simulation. Ivins was selected in the May 1984 astronaut class, and is now training for her first spaceflight, STS-32, the LDEF retrieval mission.

Mae C. Jemison; born October 17, 1956; Decatur, Alabama; single.

Received bachelor of science in chemical engineering from Stanford University in 1977 (she also fulfilled requirements for a B.A. in African and Afro-American studies) and a doctorate in medicine from Cornell University (1981). From 1983 to 1985, Dr. Jemison was the area Peace Corps medical officer for Sierra Leone and Liberia; she managed the health care delivery system for U.S. Peace Corps and U.S. Embassy personnel. In 1985, she returned to California and was working as a general practitioner when she was selected as an astronaut in 1987. She is awaiting assignment as a mission specialist and is currently participating in shuttle launch processing at the Kennedy Space Center.

Tamara E. Jernigan; born May 7, 1959, Chattanooga, Tennessee, single.

Received bachelor of science in physics, with honors (1981) and a master of science in engineering science (1983) from Stanford University, a master of science in astronomy from the University of California-Berkeley (1985) and a doctorate in space physics and astronomy from Rice University (1988). After graduating from Stanford, Jernigan worked at NASA's Ames Research Center in the theoretical studies area. Selected as an astronaut in 1985, she is now training to be a mission specialist on STS-40, a Spacelab mission dedicated to life sciences experiments.

Joseph Peter Kerwin; Captain, USN (Retired); born February 19, 1932, Oak Park, Illinois; married, three children. **Spaceflight: Skylab 2**

Received bachelor of arts degree in philosophy from the College of the Holy Cross (1953), doctor of medicine from Northwestern University Medical School (1957), and was chosen with the fourth group of astronauts in 1965. He was the science pilot for Skylab 2, and was subsequently in charge of the on-orbit branch of the Astronaut Office. From April 1982 to December 1983, Dr. Kerwin served as NASA's senior scientific representative in Australia, and was then the Director of Space and Life Sciences at Johnson Space Center. Kerwin is currently Chief Scientist, Space Station Programs, with Lockheed Corporation in Houston.

Mark C. Lee; Captain, USAF; born August 14, 1952, Viroqua, Virginia; married. **Spaceflight: STS–30**

Received bachelor of science in civil engineering, U.S. Air Force Academy (1974) and master of science in mechanical engineering, Massachusetts Institute of Technology (1980). He was serving as an F–16 pilot and Flight Commander, 4th Tactical Fighter Squadron, Hill Air Force Base, Utah when selected in the 1984 astronaut class. Lee made his first flight as a mission specialist on STS–30.

David Cornell Leestma; Commander, USN; born May 6, 1949, Muskegon, Michigan; married, four children. **Spaceflight: STS 41-G**

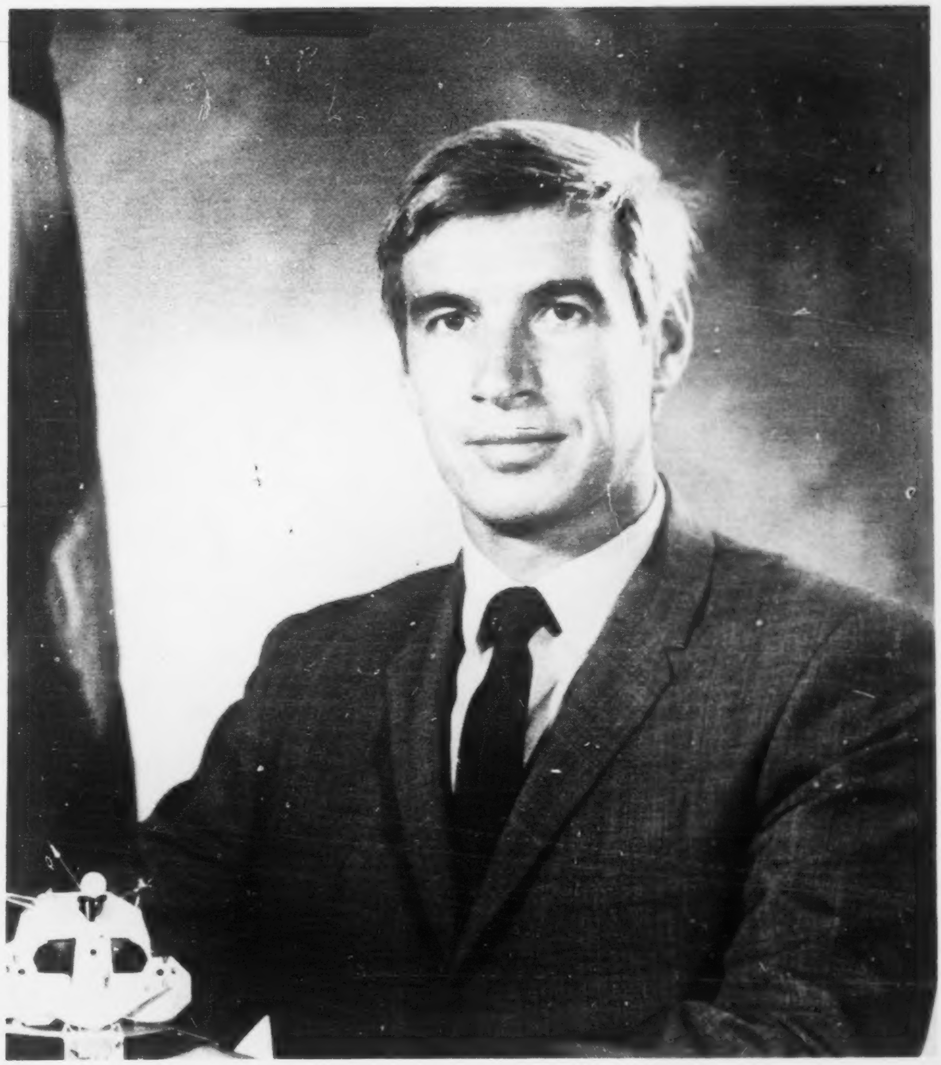
Received bachelor of science in aeronautical engineering from U.S. Naval Academy (1971), and a master of science in aeronautical engineering from U.S. Naval Postgraduate School (1972). He has made three overseas deployments flying aboard the U.S.S. John F. Kennedy; and was operational test director of F-14 software at Naval Air Station, Point Mugu, California. He was selected as an astronaut in 1980 and served as a mission specialist on STS 41-G. He is currently training as a mission specialist for STS-28, a Department of Defense mission.

William Benjamin Lenoir; civilian; born March 14, 1939, Miami, Florida; married, two children. **Spaceflight: STS–5**

Received bachelor of science degree in electrical engineering from the Massachusetts Institute of Technology (1961), master of science in electrical engineering from MIT (1962), doctorate in electrical engineering from MIT (1965), and was chosen with the sixth group of astronauts in 1967. He was backup science pilot for Skylab 3 and Skylab 4, and was a mission specialist on the STS–5 flight. In September 1984, Lenoir resigned from NASA to work at Booz-Allen and Hamilton, working in the areas of space systems development and commercialization of space. Lenoir was a Vice President at Booz-Allen in May 1989 when he decided to return to NASA, as Associate Administrator for Space Station.

Don Leslie Lind: civilian; born May 18, 1930; Midvale, Utah; married, seven children. **Spaceflight: STS 51-B**

Received bachelor of science in physics from the University of Utah (1953), served as an aviator in the U.S. Naval Reserve, received doctorate in high energy physics from the University of California at Berkeley (1964), and was chosen with the fifth group of astronauts in 1966. He was backup pilot for Skylab 3 and Skylab 4, and flew as a mission specialist on STS 51-B (Spacelab 3). He resigned from NASA and is currently a professor of physics at Utah State University.



John Anthony Llewellyn; civilian; born April 22, 1933, Cardiff, Wales; became U.S. citizen February 17, 1966; married, three children.

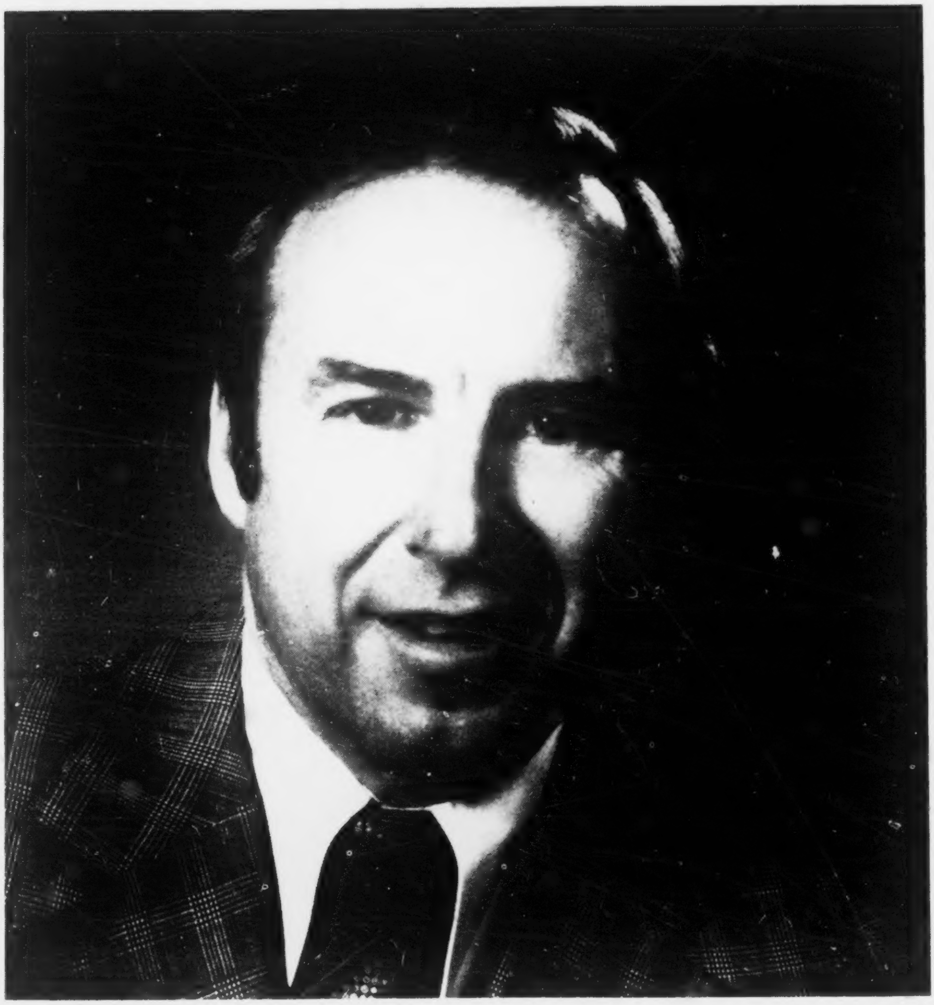
Received bachelor of science from University College, Cardiff, Wales (1955), and a doctorate in chemistry from University College (1958), and was chosen with the sixth group of astronauts in 1967. He withdrew from the program on September 6, 1968, for personal reasons and presently is the Director of Engineering Computing, College of Engineering, University of South Florida.

John "Mike" Michael Lounge; civilian; born June 28, 1946, Denver, Colorado; married, three children (one by a previous marriage). **Spaceflights: STS 51-I, STS-26**

Received bachelor of science in physics and mathematics from U.S. Naval Academy (1969) and a master of science in astrogeophysics from the University of Colorado (1970). He completed one combat tour aboard the U.S.S. Enterprise in Southeast Asia; was an instructor in the Physics Department, U.S. Naval Academy; worked in the Navy Space Project Office, Washington, D.C.; and from 1978 to 1980, worked in the Payloads Operations Division at the Johnson Space Center. He was selected as a mission specialist astronaut in 1980 and flew as a mission specialist on STS 51-I and STS-26. He is currently training for his next flight, STS-35.

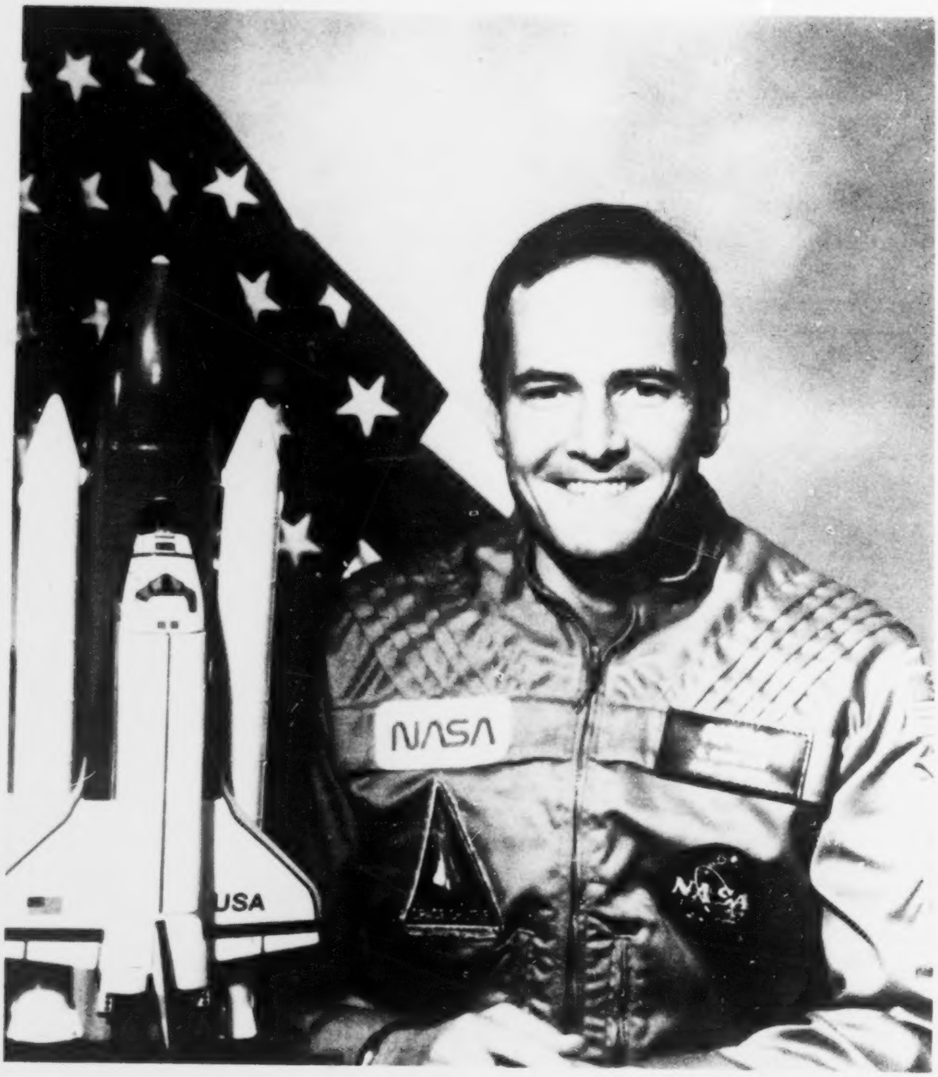
Jack Robert Lousma; Colonel, USMC (Retired); born February 29, 1936, Grand Rapids, Michigan; married, three children. **Spaceflight: Skylab 3**

Received bachelor of science in aeronautical engineering from the University of Michigan (1959), and master of science degree of aeronautical engineering from the U.S. Naval Postgraduate School (1965), and was chosen with the fifth group of astronauts in 1966. He was pilot for Skylab 3, backup docking module pilot for the Apollo-Soyuz Test Project, and commander of the STS-3 flight. Lousma retired from NASA in September 1983 and ran unsuccessfully for the Senate in Michigan in 1984. He is currently a consultant in Ann Arbor, Michigan.



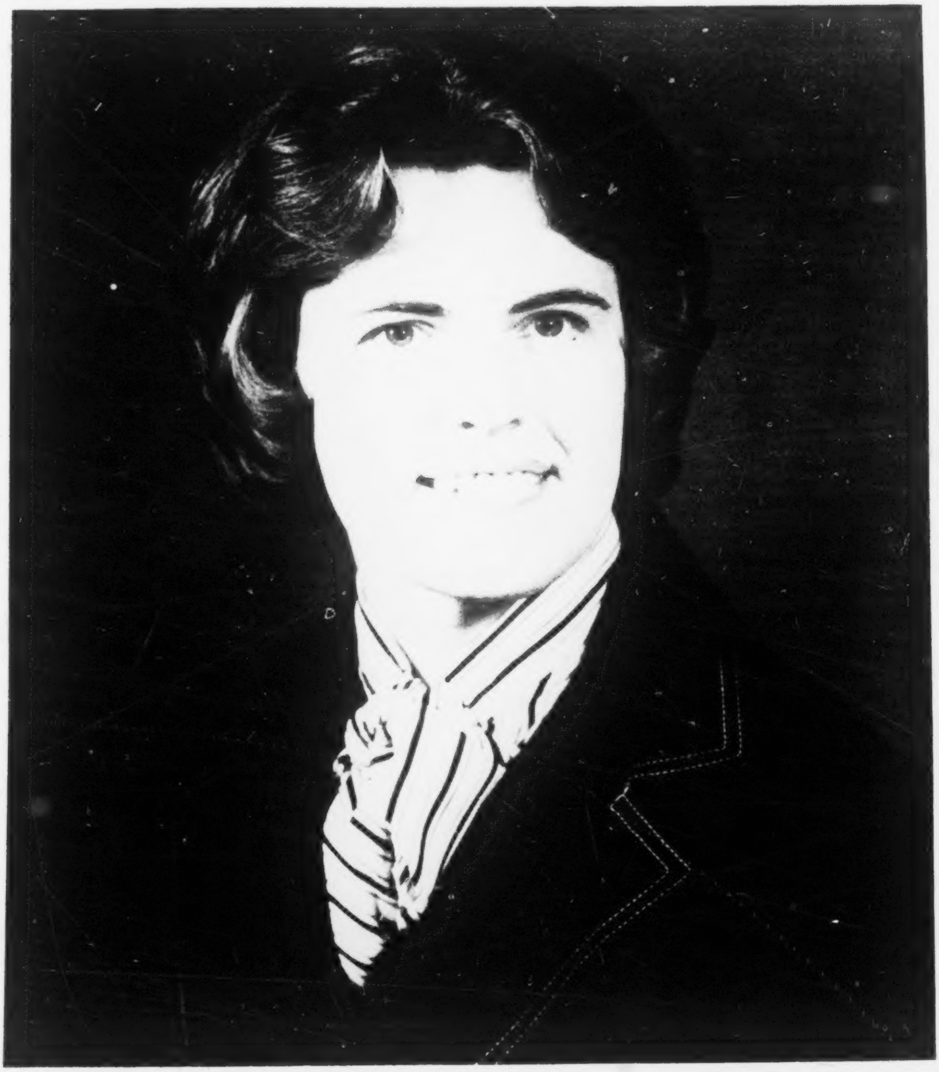
James Arthur Lovell, Jr.; Captain, USN (Retired); born March 25, 1928, Cleveland, Ohio; married, four children. **Spaceflights: Gemini 7, Gemini 12, Apollo 8, Apollo 13**

Received bachelor of science from the U.S. Naval Academy (1952) and was chosen with the second group of astronauts in 1962. He was backup pilot for Gemini-4, pilot of Gemini 7, backup command pilot for Gemini 9, command pilot for Gemini 12, command module pilot of Apollo 8, backup commander for Apollo 11, and commander of Apollo 13. In May 1971, he became Deputy Director of Science and Applications at the Johnson Space Center. Captain Lovell retired from NASA and the Navy in March 1973 to become President and Chief Executive Officer of the Bay-Houston Towing Company in Houston. He resigned that position on January 1, 1977, to become President of Fisk Telephone Systems in Houston. On January 1, 1981 he became Group Vice President of Centel Corporation. He has since been promoted to the position of Executive Vice President.



G. David Low; civilian; born February 19, 1956, Cleveland, Ohio; single.

Received bachelor of science in physics-engineering from Washington & Lee University (1978), bachelor of science in mechanical engineering from Cornell University (1980), and a master of science in aeronautics and astronautics from Stanford University (1983). He worked at Jet Propulsion Laboratory from 1980 to June 1984, and was principle spacecraft engineer for the Mars Observer Project. He was selected in the 1984 astronaut class and is currently training as a mission specialist for STS-32, the LDEF retrieval mission.



Shannon Wells Lucid; civilian; born January 14, 1943, Shanghai, China; married, three children. **Spaceflight: STS 51-G**

Received bachelor of science in chemistry from the University of Oklahoma (1963) and a master of science (1970) and doctorate (1978) in biochemistry from the University of Oklahoma. Prior to being chosen as an astronaut in 1978, Lucid worked on a variety of research assignments. She was a mission specialist on STS 51-G and is now training to be a mission specialist on STS-34, the mission that will deploy the Galileo spacecraft to Jupiter.

Thomas "Ken" Kenneth Mattingly II; Commodore, USN; born March 17, 1936, Chicago, Illinois; unmarried, one child (by a previous marriage). **Spaceflights: Apollo 16, STS-4, STS 51-C**

Received bachelor of science in aeronautical engineering from Auburn University (1958), and was chosen with the fifth group of astronauts in 1966. He was scheduled to be command module pilot on Apollo 13 but was replaced by his back-up 72 hours before launch when it was discovered he had been exposed to measles, and was command module pilot for Apollo 16. Mattingly was commander for STS-4 and STS 51-C. He resigned from NASA and is currently Director, Space Sensor Systems, U.S. Navy Space and Naval Warfare Systems Command.

Jon Andrew McBride; Captain, USN; born August 14, 1943, Charleston, West Virginia; married, four children (by a previous marriage). **Spaceflight: STS 41-G**

Received bachelor of science in aeronautical engineering from the U.S. Naval Postgraduate School (1971). During his Navy career, McBride served as a combat fighter pilot, airshow pilot and test pilot. He was chosen with the eighth group of astronauts in 1978. McBride was pilot of STS 41-G, and then served as Assistant Administrator for Congressional Relations at NASA Headquarters. He had been selected to command STS-35, but resigned in May 1989 to pursue commercial real estate ventures.

Bruce McCandless II; Captain, USN; born June 8, 1937, Boston, Massachusetts; married, two children. **Spaceflight: STS 41-B**

Received bachelor of science from the U.S. Naval Academy (1958), master of science in electrical engineering from Stanford University (1965), and was chosen with the fifth group of astronauts in 1966. He was backup pilot for Skylab 2 and a mission specialist on STS 41-B. McCandless is now training to be a mission specialist on STS-31, which will deploy the Hubble Space Telescope.

NASA
USA
NASA

Michael J. McCulley; Commander, USN; born August 4, 1943, San Diego, California; married, two children.

Received bachelor and master of science in metallurgical engineering from Purdue University (1970). He then served as an operational A-4/A-6 pilot and test pilot at the Naval Air Test Center, Patuxent River, Maryland. McCulley was selected as an astronaut in 1984 and is currently training to pilot STS-34, which will send the Galileo probe to Jupiter.

James Alton McDivitt; Brigadier General, USAF (Retired); born June 10, 1929, Chicago, Illinois; married, four children (by a previous marriage). **Spaceflights: Gemini 4, Apollo 9**

Received bachelor of science in aeronautical engineering from the University of Michigan (1959) and was chosen in the second group of astronauts in 1962. He was command pilot of Gemini 4 and commander of Apollo 9. General McDivitt managed the Apollo Spacecraft Program at Johnson Space Center from September 1969 to August 1972. He then resigned from NASA and the Air Force. In April 1975, he joined Pullman Inc. of Chicago, Illinois where he served as Vice President, President-Pullman Standard, and Executive Vice President, in that order. He resigned from Pullman on January 31, 1981 to become Vice President, Strategic Management, Rockwell International, Pittsburgh, Pennsylvania. He is now an Executive Vice President of Rockwell's Defense Electronics Operations.

Donald R. McMonagle; Major, USAF; born May 14, 1952, Flint, Michigan; married.

Received bachelor of science in astronautical engineering from the U.S. Air Force Academy (1974) and master of science in mechanical engineering from California State University—Fresno (1985). During his Air Force career, McMonagle has served as a pilot, flight instructor, test pilot, and operations officer. He also graduated from the USAF Test Pilot School (1981) and the Air and Command Staff College (1986). McMonagle was selected as an astronaut in 1987, and is awaiting a flight assignment. He is currently working in the astronaut office on issues relating to the space shuttle main engines, external tank and propulsion system.

Ronald Erwin McNair; civilian; born October 21, 1950, Lake City, South Carolina; died, January 28, 1986 in the *Challenger* explosion; was married, two children. **Spaceflight: STS 41-B**

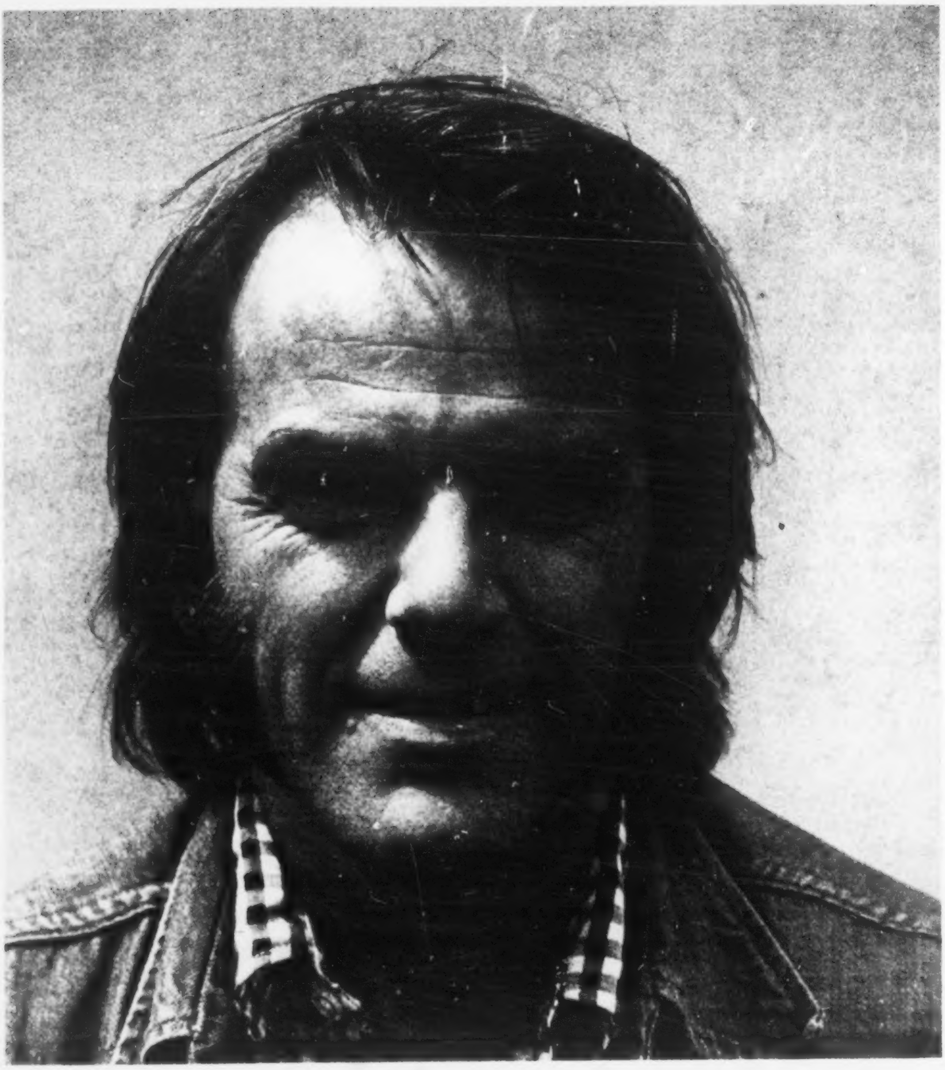
Received bachelor of science in physics from North Carolina A&T University (1971), doctorate in physics from Massachusetts Institute of Technology (1977), presented an honorary doctorate of Laws from North Carolina AT&T State University (1978), and an honorary doctorate of science from Morris College (1980). He was chosen with the eighth group of astronauts in 1978. He was a mission specialist on STS 41-B and STS 51-L (*Challenger*), which exploded 73 seconds after launch.

Carl J. Meade; Major, USAF; born November 16, 1950, Chanute Air Force Base, Illinois; married, one child.

Received bachelor of science in electrical engineering, with honors, from the University of Texas (1973) and master of science in electronics engineering from California Institute of Technology (1975). Meade's Air Force career has included research and development activities on a number of aircraft and missile systems, and he served as a test pilot and test flight instructor. Selected by NASA in the 1985 class, Meade is awaiting future assignment as a mission specialist and is currently assigned to launch support duties, both at the Kennedy Space Center and Johnson Space Center.

Bruce E. Melnick; Commander, USCG; born December 5, 1949, New York, New York; married, two children.

Received bachelor of science in engineering (with honors) from the U.S. Coast Guard Academy (1972) and master of science in aeronautical systems from the University of West Florida (1975). Melnick completed Navy flight training and served as a Coast Guard rescue pilot in Massachusetts and Alaska and as a helicopter test pilot. Melnick was selected as an astronaut in 1987 and is currently a member of the Astronaut Support Team at Kennedy Space Center assigned to prepare the orbiter cockpit and mid-deck prior to each flight. He is awaiting assignment to a shuttle mission.



Frank Curtis Michel; civilian; born June 5, 1934, La Crosse, Wisconsin; divorced, two children.

Received bachelor of science degree in physics from the California Institute of Technology (1955), doctorate in physics from CalTech (1962), served as an aviator in the U.S. Air Force Reserve, and was chosen with the fourth group of astronauts in 1965. Dr. Michel resigned from the astronaut corps in August 1969 to become a professor of physics at Rice University. He served for five years as chairman of the Space Physics and Astronomy Program and is currently the Andrew Hays Buchanan professor of astrophysics there.

Edgar Dean Mitchell; Captain, USN (Retired); born September 17, 1930, Hereford, Texas; married, two children (by a previous marriage). **Spaceflight: Apollo 14**

Received bachelor of science in industrial management from Carnegie Institute of Technology (1952), bachelor of science in aeronautical engineering from the U.S. Naval Postgraduate School (1961), doctorate in aeronautics and astronautics from the Massachusetts Institute of Technology (1964), and was chosen with the fifth group of astronauts in 1966. He was backup lunar module pilot for Apollo 10, lunar module pilot for Apollo 14 (sixth man to walk on the Moon), and backup lunar module pilot for Apollo 16. Captain Mitchell retired from the Navy and NASA in October 1972 and founded the Institute of Noetic Sciences in Palo Alto, California, of which he is chairman. He was President, Edgar Mitchell Corporation (EMCO), Palm Beach, Florida from 1974 until 1978. He is currently Chairman, Mitchell Communications Company in Florida. He has written a book entitled *Psychic Exploration: A Challenge for Science.*

Richard Michael Mullane; Colonel, USAF; born September 10, 1945, Wichita Falls, Texas; married, three children. **Spaceflights: STS 41-D, STS-27**

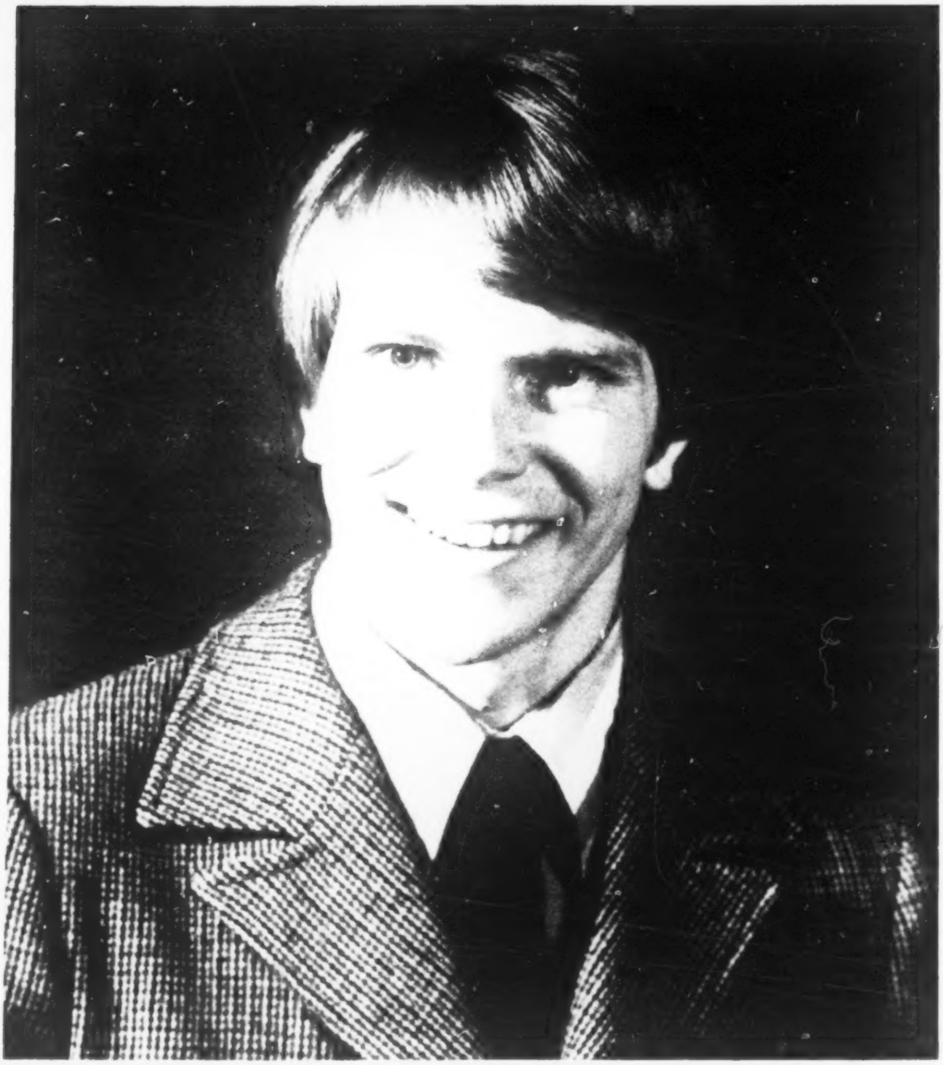
Received bachelor of science from U.S. Military Academy (1967); master of science in aeronautical engineering from the Air Force Institute of Technology (1975). He served a tour of duty in Southeast Asia, flying over 150 combat missions, was stationed as a pilot in England, and was a test pilot prior to being chosen with the eighth group of astronauts in 1978. He was a mission specialist on STS 41-D and STS-27 and is now training for his next flight, STS-36, a Department of Defense mission.

Franklin Story Musgrave; civilian; born August 19, 1935, Boston, Massachusetts; divorced, six children (by two previous marriages). **Spaceflights: STS-6, STS 51-F**

Received bachelor of science degree in math and statistics from Syracuse University (1958), master of business administration in operations analysis and computer programming from the University of California at Los Angeles (1959), bachelor of arts in chemistry from Marietta College (1960), doctor of medicine from Columbia University (1964), master of biophysics from the University of Kentucky (1966), doctorate in physiology from the University of Kentucky (1979), has served in both the U.S. Marine Corps and the U.S. Navy, and was chosen with the sixth group of astronauts in 1967. He was the backup science pilot for Skylab 2 and was a capsule communicator for Skylab 2 and 3. Dr. Musgrave served as a mission specialist on STS-6 and STS 51-F and is currently training for his next mission, STS-33, a Department of Defense mission.

Steven Ray Nagel: Colonel, USAF; born October 27, 1946, Canton, Illinois; married. **Spaceflights: STS 51-G, STS 61-A**

Received bachelor of science in aeronautical/astronautical engineering from the University of Illinois (1969). In the Air Force, Nagel has served as a pilot, instructor, and test pilot. He was chosen with the eighth group of astronauts in 1978. Nagel was a mission specialist on STS 51-G, the pilot on STS 61-A, and is now training to be the commander of STS-37, which will deploy the Gamma Ray Observatory.



George "Pinky" Driver Nelson; civilian; born July 13, 1950, Charles City, Iowa; married, two children. **Spaceflights: STS 41-C, STS 61-C, STS-26**

Received bachelor of science in physics from Harvey Mudd University (1972) and a master of science (1974) and doctorate (1977) in astronomy from the University of Washington. Prior to being selected as an astronaut in 1978, Nelson performed astronomical research in Europe and the United States. He was a mission specialist on STS 41-C, STS 61-C, and STS-26. In June 1989, he resigned from NASA to become assistant provost and professor of astronomy at the University of Washington.

Bryan Daniel O'Connor; Colonel, USMC; born September 6, 1946, Orange County, California; married, two children. **Spaceflight: STS 61-B**

Received bachelor of science in engineering from U.S. Naval Academy (1968); and a master of science in aeronautical systems from the University of West Florida (1970). He served in Korea and Japan and aboard the U.S.S. Guam in the Mediterranean. He graduated from the U.S. Navy Test Pilot School and served as a test pilot at the Navy Air Test Center at Patuxent River, Maryland. From June 1977 to June 1979, he was the Naval Air Test Center Program Manager for all AV-8 Harrier projects. Selected as an astronaut in 1980, he was the pilot of STS 61-B and is now in training for his next flight, STS-40, a Spacelab life sciences mission.

Brian Todd O'Leary; civilian, born January 27, 1940, Boston, Massachusetts; divorced, two children.

Received bachelor of arts degree in physics from Williams College (1961), master of arts in astronomy from Georgetown University (1964), doctorate in astronomy from the University of California at Berkeley (1967), and was chosen with the sixth group of astronauts in 1967. He resigned from NASA in 1968 for personal reasons and took a position on the Cornell University staff. He was an assistant professor at Hampshire College, and later became a special consultant on nuclear energy matters for the Committee on the Interior, U.S. House of Representatives. He was on the research faculty in the Department of Physics at Princeton University and Chairman of the Aerospace Education Association's national space council. O'Leary is currently Chairman of the Board of Directors of the Institute for Security and Cooperation in Outer Space. He has written *The Making of an Ex-Astronaut, The Fertile Stars, Project Space Station,* and *Mars 1999.*

Ellison Shoji Onizuka; Major, USAF; born June 14, 1946, Kealakekua, Hawaii; died January 28, 1986 in the *Challenger* explosion; was married, two children. **Spaceflight: STS 51-C**

Received bachelor of science (June 1969) and master of science (December 1969) in aerospace engineering from the University of Colorado, and was Chief of the Engineering Support Section, Training Resources Branch, USAF Test Pilot School, Edwards AFB, California when chosen with the eighth group of astronauts in 1978. He was a mission specialist on STS 51-C and on STS 51-L (*Challenger*), which exploded 73 seconds after launch.

NASA
STEVE OSWALD
NASA - JSC
NASA
SPACE SHUTTLE
ISA

Stephen S. Oswald; civilian; born June 30, 1951, Seattle, Washington; married, three children.

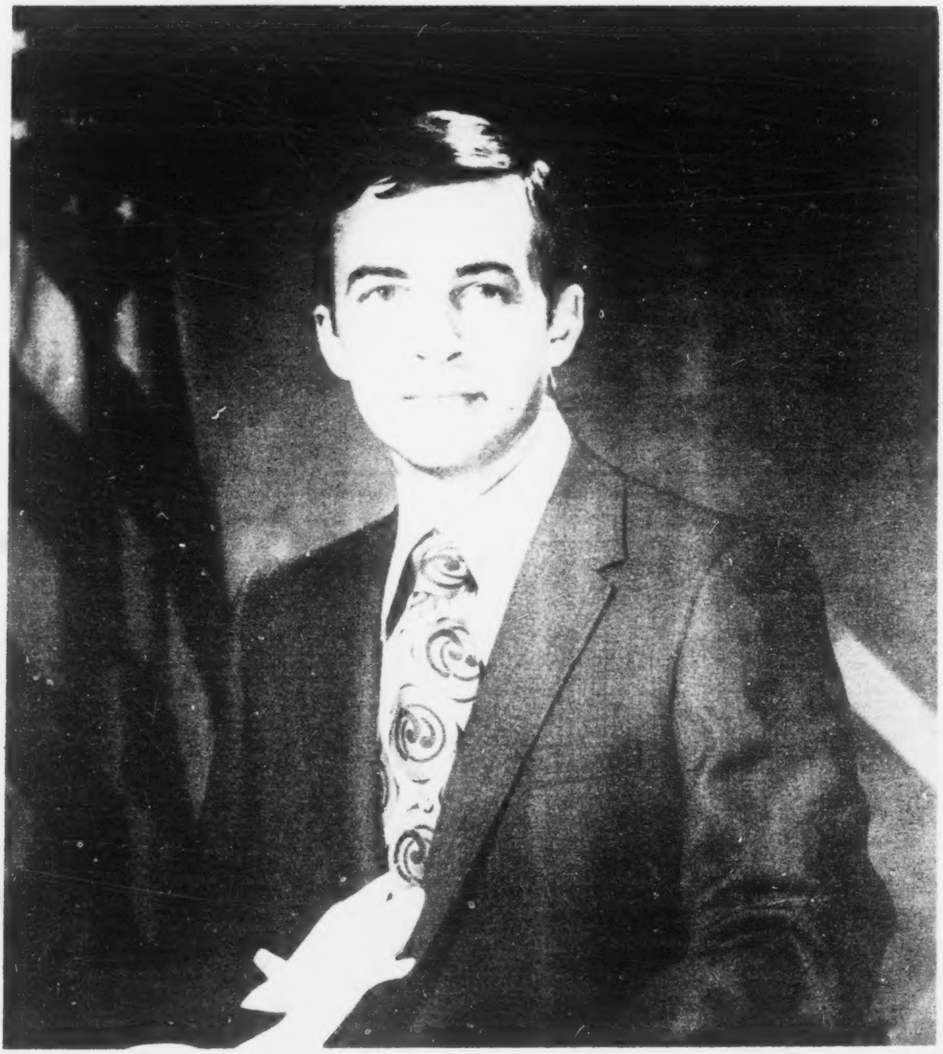
Received bachelor of science in aerospace engineering from the U.S. Naval Academy (1973). Oswald served as a Naval Aviator from 1974 to 1982. In 1983, he resigned from active duty and joined Westinghouse Corporation as a civilian test pilot. In 1984, he joined NASA as an aerospace engineer and instructor pilot. He was selected as an astronaut in 1985 and is awaiting a specific flight assignment. He is currently working with Marshall Space Flight Center on solid rocker booster redesign, development and testing, and serves as flight crew liaison for the development of an Extended Duration Orbiter capability.

Robert Franklyn Overmyer; Colonel, USMC (Retired); born July 14, 1936, Lorain, Ohio; married, three children. **Spaceflight: STS-5, STS 51-B**

Received bachelor of science degree in physics from Baldwin-Wallace College (1958), master of science in aeronautics at the U.S. Naval Postgraduate School (1964), was selected for the MOL program in 1966, and transferred to the NASA astronaut program in 1969. He was part of the support crew for the Apollo-Soyuz Test Project. He was the pilot of STS-5 and commander of STS 51-B (Spacelab 3). Since resigning from NASA, he has served as the Technical Advisor to the President, Space Systems Company, Martin Marietta Corporation.

Robert Allan Ridley Parker; civilian; born December 14, 1936, New York, New York; married, two children (by a previous marriage).
Spaceflight: STS-9

Received bachelor of arts degree in astronomy and physics from Amherst College (1958), doctorate in astronomy from the California Institute of Technology (1962), and was chosen with the sixth group of astronauts in 1967. He was mission scientist for Apollo 17 and chief scientist for the Skylab missions. Dr. Parker was a mission specialist on STS-9 (Spacelab 1) and is currently training as a mission specialist for STS-35, the ASTRO-1 mission.



Donald Herod Peterson; Colonel, USAF (Retired); born October 22, 1933, Winona, Mississippi; married, three children. **Spaceflight: STS-6**

Received bachelor of science from the U.S. Military Academy (1955), master of science in nuclear engineering from the Air Force Institute of Technology (1962), was selected for the MOL program in 1967, and transferred to the NASA astronaut program in 1969. He retired from the Air Force in January 1980. He was a mission specialist on STS-6. He resigned from NASA in December 1984 and is currently President of Aerospace Operation Consultants, Inc.

William Reid Pogue; Colonel, USAF (Retired); born January 23, 1930, Okemah, Oklahoma; married, three children. **Spaceflight: Skylab 4**

Received bachelor of science degree in education from Oklahoma Baptist University (1951), master of science in math from Oklahoma State University (1960), and was chosen with the fifth group of astronauts in 1966. He was pilot of Skylab 4. Colonel Pogue resigned from NASA on September 1, 1975, to become a Vice President of the High Flight Foundation in Colorado Springs, Colorado. He is currently in private business, William R. Pogue Associates, Inc., based in Arkansas.

NASA
BILL READDY

William F. Readdy; civilian; born January 14, 1952, Quonset Point, Rhode Island, married.

Received bachelor of science in aeronautical engineering from the U.S. Naval Academy (1974). Readdy has served on assignments in the North Atlantic, Mediterranean and Caribbean, and graduated from the U.S. Navy Test Pilot School. He resigned from active duty in 1986 to join NASA as an engineer and test pilot. Prior to his selection as an astronaut in 1987, Readdy served as the manager for the shuttle carrier aircraft program. He is currently awaiting assignment as pilot and is detailed to the orbiter project staff overseeing the construction of the new orbiter (*Endeavour*).

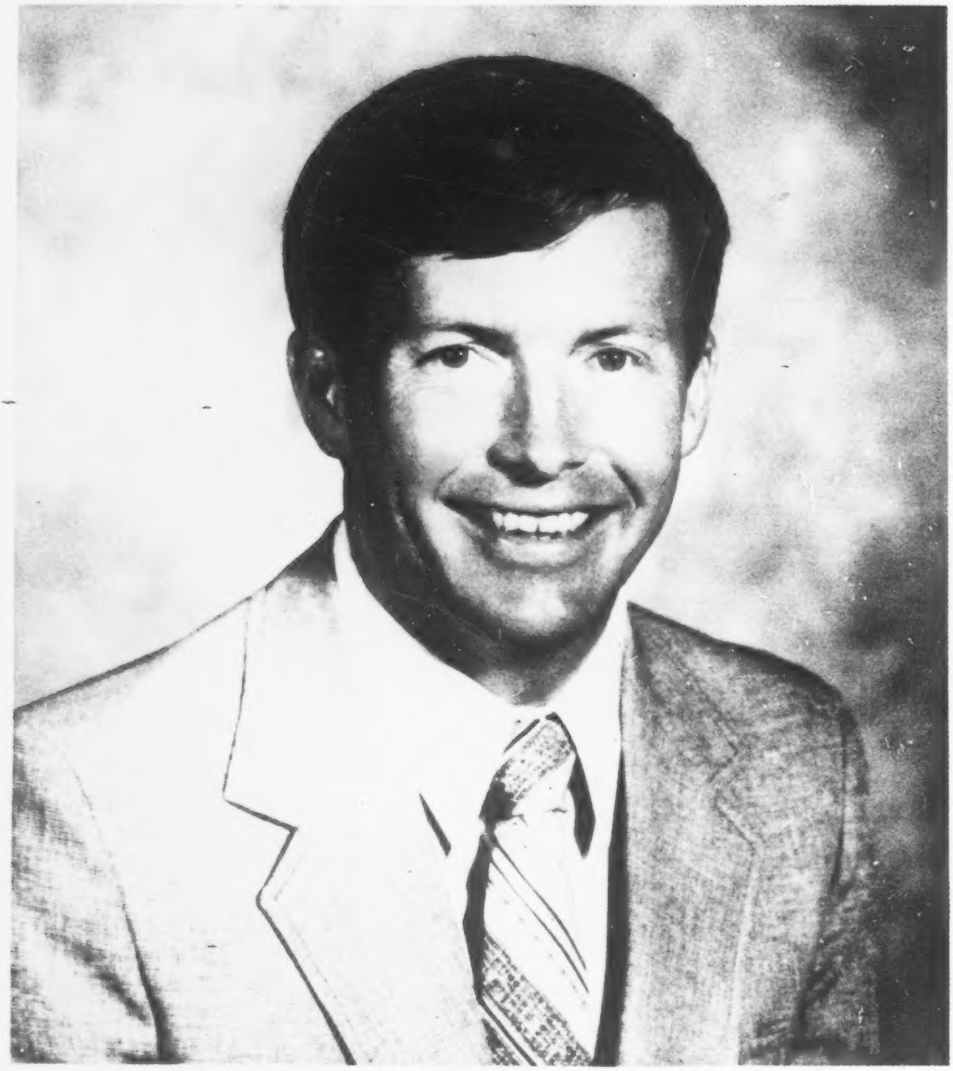
NASA
KEN REIGHTLER
J.S.C. - HOUSTON

Kenneth S. Reightler; Commander, USN; born March 24, 1951, Patuxent River, Maryland, married, two children.

Received bachelor of science in aerospace engineering from U.S. Naval Academy (1973) and master of science in aeronautical engineering from U.S. Naval Postgraduate School (1984) and systems management from the University of Southern California (1974). Reightler served as a pilot in Iceland, Sicily, and the Mediterranean. He was also a senior airborne systems instructor pilot and later chief flight instructor at the U.S. Naval Test Pilot School. Reightler was selected as an astronaut in 1987 and is awaiting a flight assignment. His current assignment is representing the astronaut office on issues involving ascent aborts and orbital maneuvering.

Judith Arlene Resnik; civilian; born April 5, 1949, Akron, Ohio; died January 28, 1986 in the *Challenger* explosion; unmarried.
Spaceflight: STS 41-D

Received bachelor of science in electrical engineering from Carnegie Mellon University (1970); doctorate in electrical engineering from the University of Maryland (1977); and was chosen with the eighth group of astronauts in 1978. She was a mission specialist on STS 41-D and STS 51-L (*Challenger*), which exploded 73 seconds after liftoff.



Richard Noel Richards; Commander, USN; born August 24, 1946, Key West, Florida; married. **Spaceflight: STS-28**

Received bachelor of science in chemical engineering from the University of Missouri (1969), and a master of science in aeronautical systems from the University of West Florida (1970). He graduated from the U.S. Naval Test Pilot School at Patuxent River, Maryland, in 1976, and served as a test pilot. He is currently assigned to be pilot on STS-28, and is now in training for that mission.

Sally Kristen Ride; civilian; born May 26, 1951, Los Angeles, California; divorced. **Spaceflights: STS-7, STS 41-G**

Received bachelor of science in physics (1973), bachelor of arts in English (1973), master of science in physics (1975), and doctorate in physics (1978) from Stanford University. When chosen as an astronaut in 1978, she was involved in teaching and research activities. Dr. Ride served as a mission specialist for STS-7, becoming the first American woman in space, and was also a mission specialist on STS 41-G, becoming the first American woman to make two spaceflights. In 1986, she served as a member of the Presidential Commission on the Space Shuttle *Challenger* Accident (the Rogers Commission), and from 1986-1987 chaired a NASA task force that prepared a report on the future of the civilian space program entitled Leadership and America's Future in Space. She resigned from NASA in 1987 to join the Center for International Security and Arms Control at Stanford University. In June 1989, she announced that she would leave Stanford to become Director of the California Space Institute, part of the University of California at San Diego, and a physics professor at the university.

Stuart Allen Roosa; Colonel, USAF (Retired); born August 15, 1933, Durango, Colorado; married, four children. **Spaceflight: Apollo 14**

Received bachelor of science in aeronautical engineering from the University of Colorado (1960) and was chosen with the fifth group of astronauts in 1966. He was the command module pilot of Apollo 14, and backup command module pilot for Apollo 16 and Apollo 17. Colonel Roosa resigned from NASA on February 1, 1976 to become Vice President for International Affairs, U.S. Industries Middle East Development Company, based in Athens, Greece. In 1977, he returned to the United States to become President of Jet Industries in Austin, Texas. He was later in private business in Austin and is currently President, Gulf Coast Coors, Inc.

Jerry Lynn Ross; Lieutenant Colonel, USAF; born January 20, 1948, Crown Point, Indiana; married, two children. **Spaceflights: STS 61-B, STS-27**

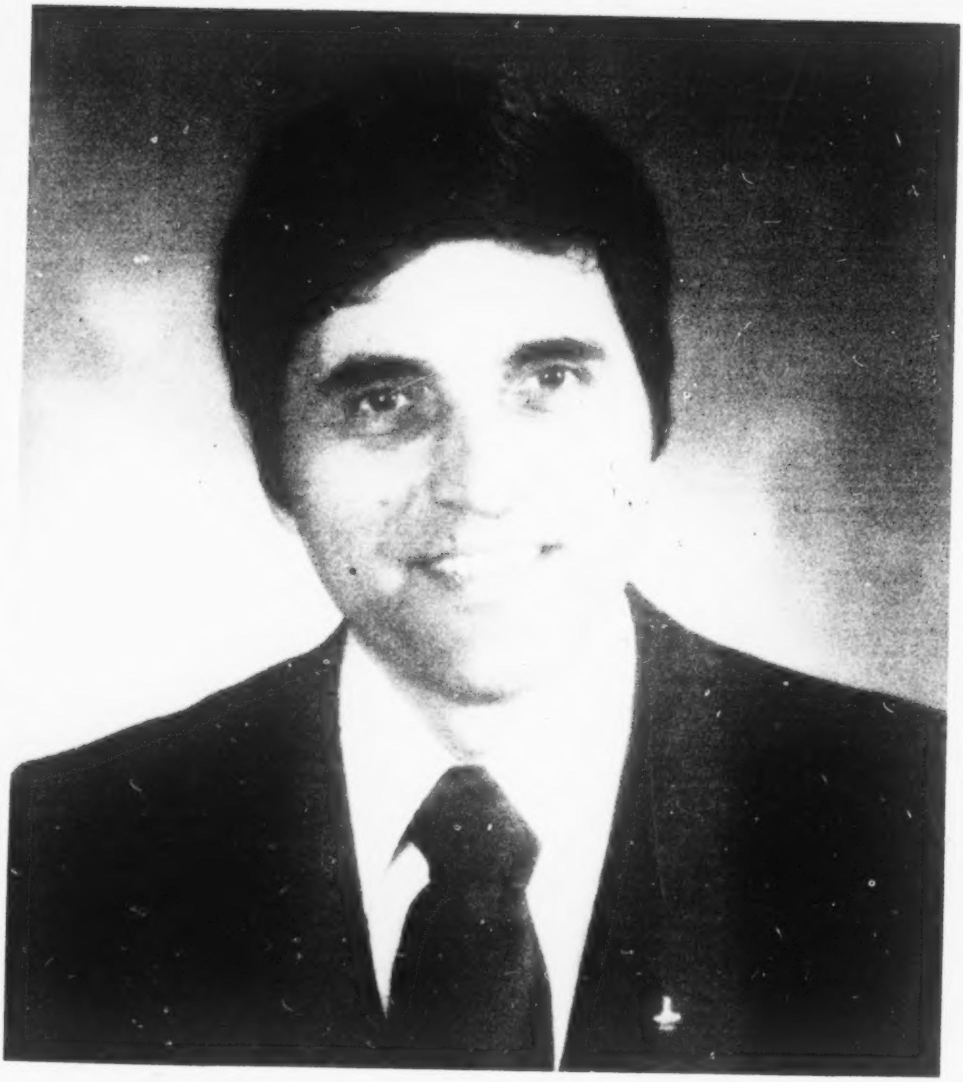
Received bachelor of science (1970) and master of science (1972) in mechanical engineering from Purdue University. He was chief B-1 flight test engineer at Edwards Air Force Base, California, and was chosen as a mission specialist astronaut in 1980. He flew as a mission specialist on STS 61-B and STS-27 and is currently training to serve as a mission specialist on STS-37, which will deploy the Gamma Ray Observatory.

Mario Runco, Jr.; Lieutenant Commander, USN; born January 26, 1952, New York, New York; married, one child.

Received bachelor of science in meteorology and physical oceanography from the City College of New York (1974) and master of science in meteorology from Rutgers University (1976). Runco has worked as a research hydrologist and headed oceanographic surveys of the Indian Ocean and the Java Sea. He has also taught at the Naval Postgraduate School. Runco was selected as an astronaut in 1987 and is awaiting assignment as a mission specialist.

Walter Marty Schirra, Jr.; Captain, USN (Retired); born March 12, 1923, Hackensack, New Jersey; married, two children. **Spaceflights: Mercury-Atlas 8, Gemini 6, Apollo 7**

Received bachelor of science from the U.S. Naval Academy (1945) and was chosen in the first group of astronauts in 1959. He was backup pilot for Mercury-Atlas 7 (Aurora 7), pilot of Mercury-Atlas 8 (Sigma 7), backup command pilot of Gemini 3, command pilot of Gemini 6, and commander of Apollo 7. Captain Schirra retired from NASA and the Navy in July 1969 to become Chairman and Chief Executive Officer of the Environmental Control Company, Englewood, Colorado, and Chairman, Sernco, Inc. In 1976, he became Director of Marketing-Powerplant and Aerospace Systems, Johns Manville Company, and Vice President, Johns Manville Corporation, in Denver, Colorado. In December 1977, he resigned those positions to become Vice President for Development for Goodwin Companies in Middleton, Colorado. In 1980 he was elected to the Board of Directors of Electromedics Inc. He is currently a consultant in Sante Fe, California and a public speaker.



Harrison "Jack" Hagan Schmitt; civilian; born July 3, 1935, Santa Rita, New Mexico; married. **Spaceflight: Apollo 17**

Received bachelor of science degree in science from the California Institute of Technology (1957), doctorate in geology at Harvard University (1964), and was chosen with the fourth group of astronauts in 1965. He was backup lunar module pilot for Apollo 15, and lunar module pilot for Apollo 17 (twelfth man to walk on the Moon). In May 1974, he was named NASA's Assistant Administrator for Energy Programs, a position he resigned on August 30, 1975, to enter politics. He was U.S. Senator from the State of New Mexico from 1976–1982. He was also a member of the President's Foreign Intelligence Advisory Board and the National Strategic Materials and Minerals Program Advisory Committee, and has served as an advisor to the Department of Defense. He is currently Director, Nord Resources, Sunwest Financial Services.

Russell "Rusty" Louis Schweickart: civilian; born October 25, 1935, Neptune, New Jersey; divorced, five children. **Spaceflight: Apollo 9**

Received bachelor of science in aeronautical engineering from Massachusetts Institute of Technology (1956), master of science in aeronautics and astronautics from MIT (1963), served in the U.S. Air Force as an aviator, and was chosen with the third group of astronauts in 1963. He was lunar module pilot on Apollo 9 and backup commander for Skylab 2. Mr. Schweickart was NASA's Director of User Affairs in the Office of Applications before becoming Assistant for Payload Operations in the Office of Planning and Program Integration at NASA Headquarters in November 1976. He went on a leave of absence from NASA to act as science adviser to Governor Brown of California, then resigned from NASA in 1979. In August 1980, he became Chairman of the California State Energy Commission and was later a visiting scientist at the Massachusetts Institute of Technology. He is currently President of the Association of Space Explorers and a consultant and lecturer.

Francis "Dick" Richard Scobee: Major, USAF (Retired); born May 19, 1939, Cle Elum, Washington; died January 28, 1986 in the *Challenger* explosion; was married, two children. **Spaceflight: STS 41-C**

Received bachelor of science in aerospace engineering from the University of Arizona (1965), and was a test pilot, Air Force Flight Test Center, Edwards AFB, California when he was chosen with the eighth group of astronauts in 1978. He retired from the Air Force in January 1980. He was pilot of the STS 41-C mission and was the commander of STS 51-L (*Challenger*), which exploded 73 seconds after liftoff.

David Randolph Scott; Colonel, USAF (Retired); born June 6, 1932, San Antonio, Texas; married, two children. **Spaceflights: Gemini 8, Apollo 9, Apollo 15**

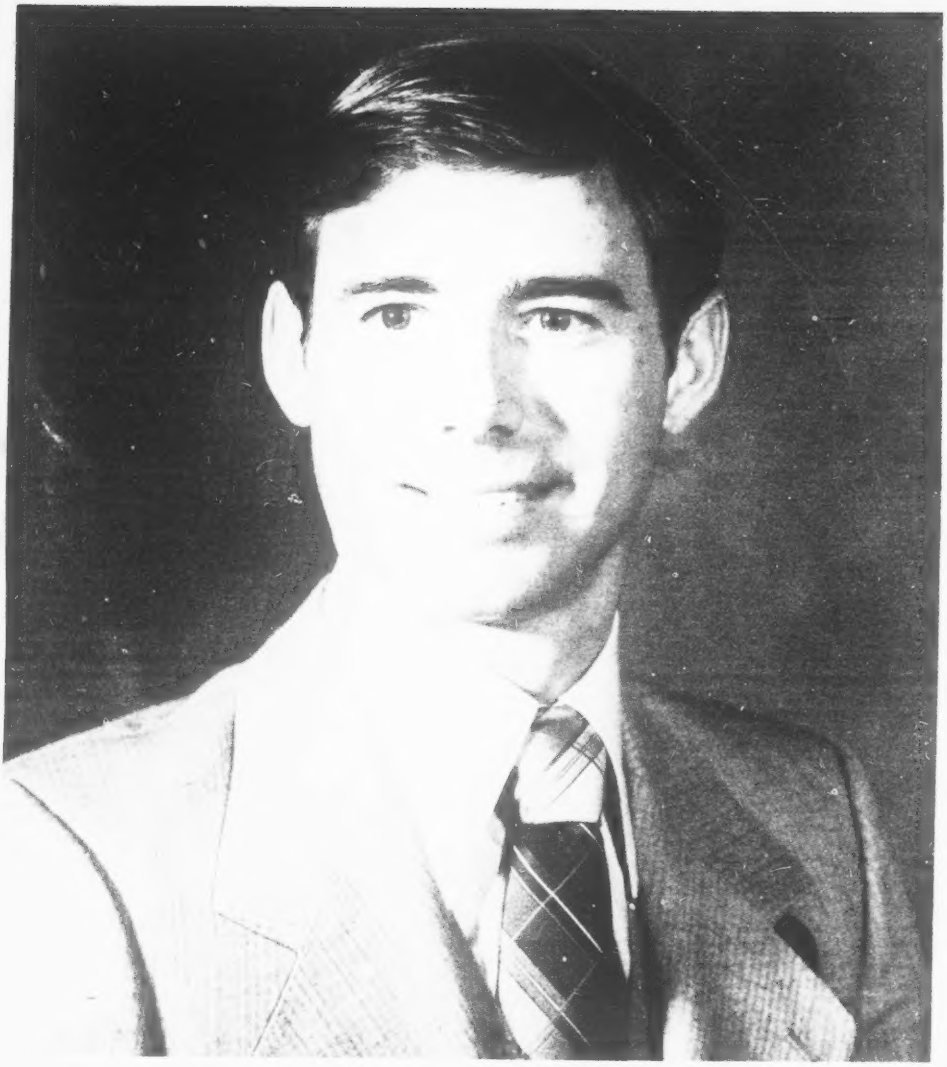
Received bachelor of science degree from the U.S. Military Academy (1954), master of science in aeronautics and astronautics and an engineer of aeronautics and astronautics degree from the Massachusetts Institute of Technology (1962), and was chosen with the third group of astronauts in 1963. He was pilot of Gemini 8, command module pilot of Apollo 9, backup commander of Apollo 12, and commander of Apollo 15 (seventh man to walk on the Moon). In July 1972, Colonel Scott became Special Assistant for Mission Operations for the Apollo-Soyuz Test Project, and in April 1975 was appointed Director, NASA Dryden Flight Research Center, Edwards, California. He resigned that position on October 30, 1977, to found his own company, Scott-Preyss Associates which is now Scott Science and Technology, Inc. in Los Angeles.

Margaret Rhea Seddon; civilian; born November 8, 1947, Murfreesboro, Tennessee; married (to astronaut Robert L. Gibson), two children. **Spaceflight: STS 51-D**

Received bachelor of arts in physiology from the University of California, Berkeley (1970) and a doctorate of medicine from the University of Tennessee College of Medicine (1973). Seddon was a resident physician in the Department of Surgery, City of Memphis Hospital, Memphis, Tennessee when she was chosen with the eighth group of astronauts in 1978. She served as a mission specialist on STS 51-D and will be a mission specialist on STS-40, a dedicated life sciences Spacelab mission.

Elliot McKay See, Jr.; civilian; born July 23, 1927, Dallas, Texas; died February 28, 1966, in the crash of a T–38 jet near St. Louis, Missouri; was married, three children.

Received bachelor of science degree from the U.S. Merchant Marine Academy (1949), served as an aviator in the U.S. Navy, received master of science in engineering from the University of California at Los Angeles (1962), and was chosen in the second group of astronauts in 1962. He was backup pilot for Gemini 5 and was slated to be command pilot for Gemini 9 at the time of his death.



Brewster Hopkinson Shaw, Jr.; Colonel, USAF; born May 16, 1945, Cass City, Michigan; married, three children. **Spaceflights: STS-9, STS 61-B**

Received bachelor of science (1968) and master of science (1969) in engineering mechanics from the University of Wisconsin, and was an instructor with the U.S. Air Force Test Pilot School, Edwards AFB, California when he was chosen with the eighth group of astronauts in 1978. He served as a pilot of STS-9 (Spacelab 1), was the commander of STS 61-B, and is now training to be the commander of STS-28, a classified Department of Defense mission.

Alan Bartlett Shepard, Jr.; Rear Admiral, USN (Retired); born November 18, 1923, East Derry, New Hampshire; married, two children. **Spaceflights: Mercury-Redstone 3, Apollo 14**

Received bachelor of science degree from the U.S. Naval Academy (1944) and was chosen with the first group of astronauts in 1959. He was pilot of Mercury-Redstone 3 (Freedom 7) becoming America's first man in space, backup pilot for Mercury-Atlas 9, was subsequently grounded due to an inner ear ailment until May 7, 1969 (during which time he served as chief of the Astronaut Office), commander of Apollo 14 (fifth man to walk on the Moon), and in June 1971 resumed duties as chief of the Astronaut Office. He retired from NASA and the Navy on Aug. 1, 1974, to join the Marathon Construction Company of Houston, Texas, as partner and chairman. He is currently President of Seven-Fourteen Enterprises, Houston, Texas.

William M. Shepherd; Commander, USN; born July 29, 1949, Oak Ridge, Tennessee; single. **Spaceflight: STS-27**

Received bachelor of science in aerospace engineering, U.S. Naval Academy (1971), master of science and the degree of ocean engineer from Massachusetts Institute of Technology (1978). He was a Navy SEAL, serving as Commander, Special Boat Unit Twenty, Little Creek, Virginia when selected in the May 1984 astronaut class. Shepherd's first flight as a mission specialist was STS-27; he is currently awaiting future flight assignments.

Loren James Shriver; Colonel, USAF; born September 23, 1944, Jefferson, Iowa; married, four children. **Spaceflight: STS 51-C**

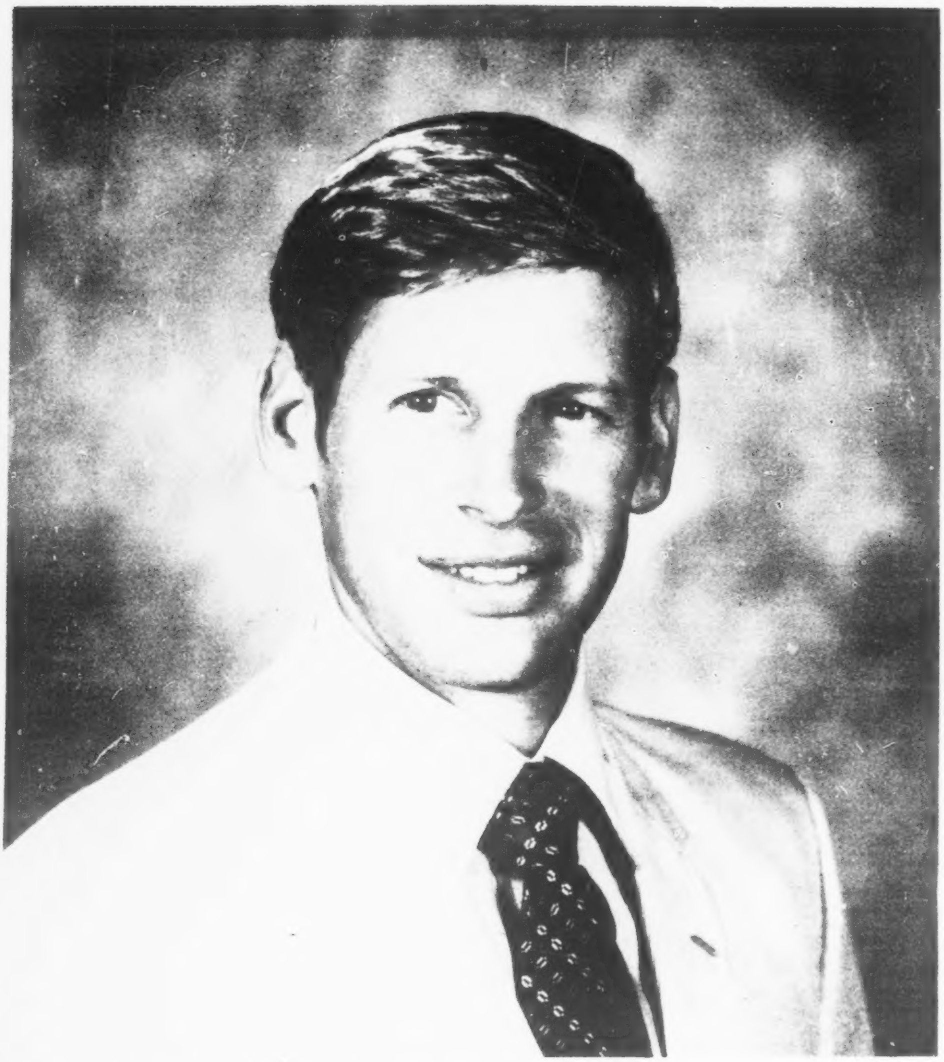
Received bachelor of science from U.S. Air Force Academy (1967); master of science in astronautics from Purdue University (1968); and was a test pilot, Air Force Flight Test Center, Edwards AFB, California when he was chosen with the eighth group of astronauts in 1978. He was pilot of STS 51-C and will be commander of STS-31, which will deploy the Hubble Space Telescope.

Donald "Deke" Kent Slayton: Major, USAF (Retired); born March 1, 1924, Sparta, Wisconsin; married, one child (by a previous marriage). **Spaceflight: Apollo-Soyuz Test Project**

Received bachelor of science in aeronautical engineering from the University of Minnesota (1949) and was chosen with the first group of astronauts in 1959. He was chosen as command pilot for Mercury-Atlas 7 (Aurora 7), but was removed due to detection of a heart murmur. He resigned his commission from the Air Force in November 1963, but continued as an active member of the astronaut team, becoming Director of Flight Crew Operations, a position he held until February 1974. Mr. Slayton returned to flight status in March 1972 and was docking module pilot for the Apollo-Soyuz Test Project. He was also the manager for the shuttle orbital flight tests. He left NASA in February 1982 and currently serves as a consultant for Aerospace Corp. and President of Space Services, Inc., Houston, Texas.

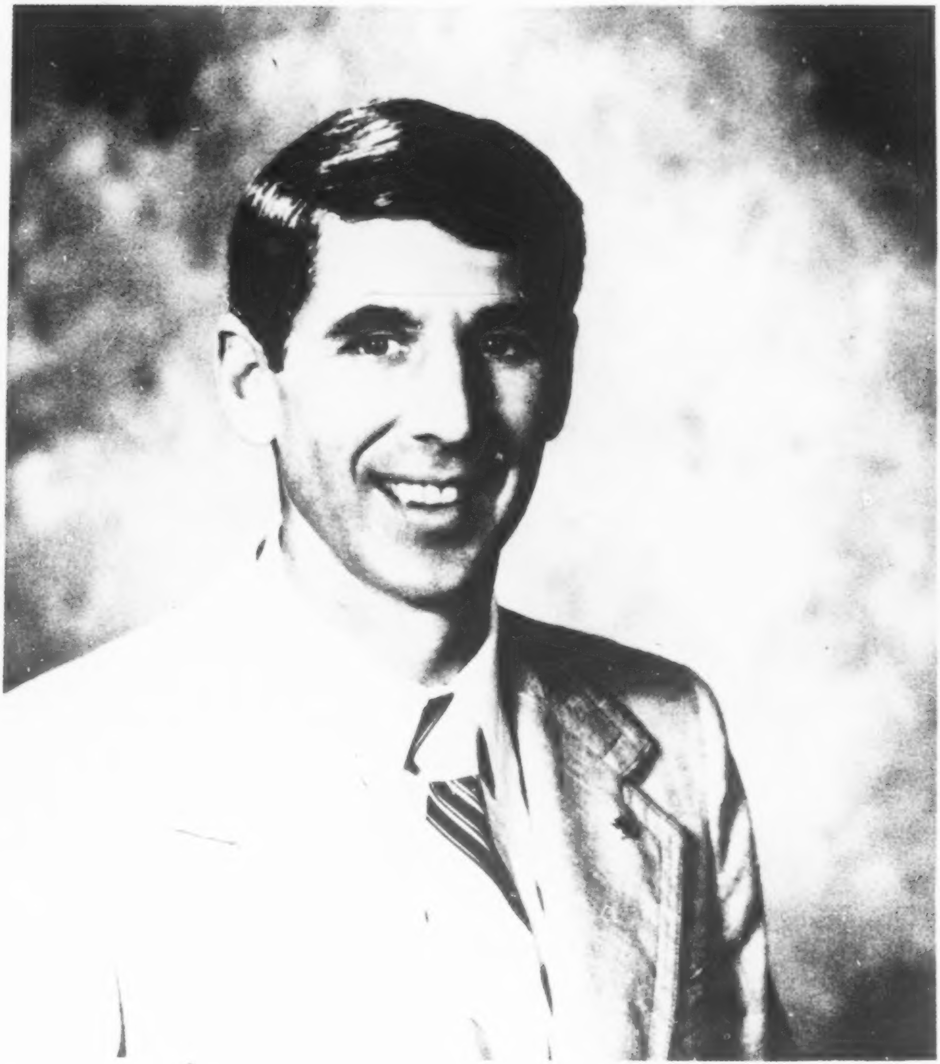
Michael John Smith; Commander, USN; born April 30, 1945, Morehead City, North Carolina; died January 28, 1986 in the *Challenger* explosion; was married, three children.

Received bachelor of science in naval science from the U.S. Naval Academy (1967), and a master of science in aeronautical engineering from the U.S. Naval Postgraduate School (1968). He completed a Vietnam tour of duty aboard the U.S.S. Kitty Hawk, graduated from the U.S. Navy Test Pilot School in 1974, and served for 18 months as an instructor at the U.S. Navy Test Pilot School. He was chosen as a pilot astronaut in 1980, and was the pilot of STS 51-L (*Challenger*), which exploded 73 seconds after liftoff.



Sherwood Clark Spring; Lieutenant Colonel, USA; born September 3, 1944, Hartford, Connecticut; married, one child. **Spaceflight: STS 61-B**

Received bachelor of science in general engineering from the U.S. Military Academy (1967), and a master of science in aerospace engineering from the University of Arizona (1974). He was a combat pilot in Vietnam, and a test pilot at Edwards Air Force Base, California. He was serving as an operations officer for the 19th Aviation Battalion in Pyontaek, Korea, when he was chosen as an astronaut in 1980. He was a mission specialist on STS 61-B. Spring resigned from NASA in 1987 to resume his military career; he is currently the Director of the U.S. Army Space Program Office.



Robert Clyde Springer; Colonel, USMC; born May 21, 1942, St. Louis, Missouri; married, three children. **Spaceflight: STS–29**

Received bachelor of science in naval science from the U.S. Naval Academy (1964), and a master of science in operations research and systems analysis from the U.S. Naval Postgraduate School (1971). He served as a combat pilot in Vietnam; graduated from the U.S. Navy Test Pilot School at Patuxent River, Maryland, in 1975; and served as a test pilot. He was an aide-de-camp for the Commanding General, Fleet Marine Force, Atlantic, when he was chosen as a mission specialist astronaut in 1980. He was a mission specialist on STS–29, and is currently awaiting future assignments.

Thomas Patten Stafford; Lieutenant General, USAF (Retired); born September 17, 1930, Weatherford, Oklahoma; married, two children (by a previous marriage). **Spaceflights: Gemini 6, Gemini 9, Apollo 10, Apollo-Soyuz Test Project**

Received bachelor of science degree from the U.S. Naval Academy (1952) and was chosen with the second group of astronauts in 1962. He was backup pilot for Gemini 3, pilot for Gemini 6, became command pilot for Gemini 9 upon the death of a prime crew member, backup commander for Apollo 7, commander of Apollo 10, and commander of the Apollo-Soyuz Test Project. He resigned from NASA on November 1, 1975, to become commander of the Air Force Flight Test Center, Edwards Air Force Base, California. In March 1978 he was promoted to Air Force Deputy Chief of Staff for Research and Development in Washington, D.C. In November 1979, he retired from the Air Force and became Executive Vice President of Commercial Sales and Finance for American Farm Line in Oklahoma City, Oklahoma. He is currently a consultant with Defense Technology, Oklahoma City and is also Vice Chairman, Stafford, Burke and Hecker Inc, Alexandria, Virginia.

Robert Lee Stewart; Brigadier General, USA; born August 13, 1942, Washington, D.C.; married, two children. **Spaceflights: STS 41-B, STS 51-J**

Received bachelor of science in mathematics from the University of Southern Mississippi (1964), master of science in aerospace engineering from the University of Texas, Arlington (1971), and was a test pilot, U.S. Army Aviation Engineering Flight Activity, Edwards AFB, California when he was chosen with the eighth group of astronauts in 1978. He was a mission specialist on STS 41-B and STS 51-J. He resigned from NASA and is currently the Deputy Commander, U.S. Strategic Defense Command in Huntsville, Alabama.

Kathryn Dwyer Sullivan: civilian; born October 3, 1951, Paterson, New Jersey; single. **Spaceflight: STS 41-G**

Received bachelor of science in earth sciences from the University of California, Santa Cruz (1973), doctorate in geology from Dalhousie University, Halifax, Nova Scotia (1978), and was chosen with the eighth group of astronauts in 1978. She served as a mission specialist on STS 41-G, during which she became the first American woman to perform an EVA (spacewalk). Sullivan served on the National Commission on Space from 1985 to 1986. She is currently training to be a mission specialist on STS-31, which will deploy the Hubble Space Telescope.

John Leonard Swigert, Jr.: civilian; born August 30, 1931, Denver, Colorado; died December 27, 1982, of bone cancer; was single.

Spaceflight: Apollo 13

Received bachelor of science degree in mechanical engineering from the University of Colorado (1953), served as an aviator in the U.S. Air Force, received master of science in aerospace science from Rensselaer Polytechnic Institute (1965), master of science in business administration from the University of Hartford (1967), and was chosen with the fifth group of astronauts in 1966. He was scheduled to be backup command module pilot for Apollo 13, but became command module pilot 72 hours prior to launch when a prime crew member was exposed to measles. Mr. Swigert took a leave of absence from NASA in April 1973 to become Executive Director of the Committee on Science and Technology, U.S. House of Representatives. He resigned from NASA and the committee on August 31, 1977, to enter politics. In 1979 he became Vice President of B.D.M. Corporation, Golden, Colorado, and on November 11, 1982 he was elected to the U.S. House of Representatives. He died on December 28, 1982 of bone cancer, before he could be sworn in.

Norman Earl Thagard; civilian; born July 3, 1943, Marianna, Florida; married, three children. **Spaceflights: STS-7, STS 51-B, STS-30**

Received bachelor of science (1965) and master of science (1966) in engineering science from Florida State University; served in the U.S. Marine Corps as an aviator; received doctor of medicine from the University of Texas Southwestern Medical School (1977); and was chosen with the eighth group of astronauts in 1978. He flew as a mission specialist on STS-7, STS 51-B (Spacelab 3), and STS-30, and is awaiting future assignments.

NASA
STEVE THORNE
JSC HOUSTON
NASA
USA

Stephen D. Thorne; Lieutenant Commander, USN; born February 11, 1953, Frankfurt-on-Main, West Germany; died May 24, 1986 in an airplane crash; was married.

Received bachelor of science in systems engineering from the U.S. Naval Academy (1975) and was selected as an astronaut in 1985.

Kathryn C. Thornton; civilian; born August 17, 1952, Montgomery, Alabama; married, four children.

Received bachelor of science in physics from Auburn University (1974) and a master of science (1977) and doctorate (1979) in physics from the University of Virginia. She was awarded a NATO Postdoctoral Fellowship for research at the Max Planck Institute for Nuclear Physics in West Germany. Thornton was a physicist at the U.S. Army Foreign Science and Technology Center when selected as an astronaut in May 1984. She is currently training as a mission specialist for STS-33, a Department of Defense mission.

William Edgar Thornton; civilian; born April 14, 1929, Faison, North Carolina; married, two children. **Spaceflights: STS-8, STS 51-B**

Received bachelor of science degree in physics from the University of North Carolina (1952), doctor of medicine from the University of North Carolina (1963), served in the U.S. Air Force, and was chosen with the sixth group of astronauts in 1967. He is a clinical instructor in the Department of Medicine at the University of Texas. He was a crew member of the Skylab Medical Experiments Altitude Test, a member of the support crew for Skylab 2, 3, and 4, and served as mission specialist on STS-8 in 1983 and on STS 51-B (Spacelab 3) in 1985.

NASA
NASA
THUOT
JSC HOUSTON
NASA

Pierre J. Thuot; Lieutenant Commander, USN; born May 19, 1955, Groton, Connecticut; married.

Received bachelor of science in physics from the U.S. Naval Academy (1977) and master of science in systems management from the University of Southern California (1985). Thuot served in the Mediterranean and Caribbean and as a test pilot, and graduated from the U.S. Navy Test Pilot School and Navy Fighter Weapons School. He was selected as an astronaut in 1985, and has worked in many areas at NASA including development of EVA equipment, software verification, and as CAPCOM for STS–29 and STS–30. He is currently in training for STS–36, a dedicated Department of Defense mission.

Richard Harrison Truly; Vice Admiral, USN; born November 12, 1937, Fayette, Mississippi; married, three children. **Spaceflights: STS-2, STS-8**

Received bachelor of aeronautical engineering degree from the Georgia Institute of Technology (1959), was selected for the MOL program in 1965, and transferred to the NASA astronaut group in 1969. He was a member of the astronaut support crew for Skylab 2, 3, and 4, and the Apollo-Soyuz Test Project. He was a member of one of the two shuttle approach and landing test crews, and was the pilot of STS-2 and commander of STS-8. He then resigned from NASA to become commander of the Naval Space Command, but returned to NASA in 1986, following the *Challenger* tragedy, to serve as Associate Administrator for Space Flight, the office that oversees the space shuttle program. He has been confirmed by the Senate to be the Administrator of NASA, effective July 1, 1989, at which time he will retire from the Navy.

James "Ox" Dougal Adrianus van Hoften; civilian; born June 11, 1944, Fresno, California; married, three children. **Spaceflights: STS 41-C, STS 51-I**

Received bachelor of science in civil engineering from the University of California, Berkeley (1966); master of science in hydraulic engineering from Colorado State University (1968); served in the U.S. Navy as an aviator; received doctorate in fluid mechanics from Colorado State University (1976); and was Assistant Professor of Civil Engineering, University of Houston, when he was chosen with the eighth group of astronauts in 1978. He was a mission specialist on STS 41-C and STS 51-I. He has resigned from NASA and is currently Manager of Space Programs, Bechtel National Inc., in San Francisco.

Charles Lacy Veach; civilian; born September 18, 1944, Chicago, Illinois; married, two children.

Received bachelor of science in engineering management from the Air Force Academy (1966). In 1982, he began working at Johnson Space Center as an engineer and research pilot. In May 1984, Veach was selected as an astronaut and is awaiting assignment as a mission specialist on future shuttle missions.

James S. Voss; Major, USA; born March 3, 1949, Cordova, Alabama; married, one child.

Received bachelor of science in aerospace engineering from Auburn University (1972) and master of science in aerospace engineering sciences from the University of Colorado (1974). He attended the Infantry basic course, Airborne and Ranger schools and served in Germany, taught at the U.S. Military Academy, and was a flight test engineer prior to joining NASA at the Johnson Space Center in 1984 as a vehicle integration test engineer. Immediately prior to being selected as an astronaut in 1987, Voss participated in the STS 51-L *Challenger* accident investigation. He is awaiting a crew assignment as a mission specialist, and is currently a flight crew representative on safety issues.

David Mathieson Walker; Captain, USN; born May 20, 1944, Columbus, Georgia; single, two children (by a previous marriage). **Spaceflights: STS 51-A, STS-30**

Received bachelor of science from U.S. Naval Academy (1966), and was a naval aviator when he was chosen with the eighth group of astronauts in 1978. During his naval career, Walker flew combat missions, was an engineering test pilot, and participated in testing of F-14 aircraft. He was pilot of STS 51-A and the commander of STS-30.

Paul Joseph Weitz; Captain, USN (Retired); born July 25, 1932, Erie, Pennsylvania; married, two children. **Spaceflights: Skylab 2, STS-6**

Received bachelor of science degree in aeronautical engineering from Pennsylvania State University (1954), master of science in aeronautical engineering from the U.S. Naval Postgraduate School (1964), and was chosen with the fifth group of astronauts in 1966. He was pilot for Skylab 2, and commander of STS-6. Captain Weitz retired from the Navy on June 1, 1976. He is Deputy Director of NASA's Johnson Space Center, but continues to be an active member of the astronaut corps.

NASA
USA
NASA

James D. Wetherbee; Commander, USN; born November 27, 1952, Flushing, New York; married.

Received bachelor of science in aerospace engineering from the University of Notre Dame (1974). He was serving as a test pilot, Naval Air Station Lemoore, California when selected as an astronaut in May 1984 and is currently training as pilot for STS-32, the LDEF retrieval mission.

Edward Higgins White II; Lieutenant Colonel, USAF; born November 14, 1930, San Antonio, Texas; died January 27, 1967, in the Apollo 204 fire at Cape Kennedy, Florida; was married, two children. **Spaceflight: Gemini 4**

Received bachelor of science degree from the U.S. Military Academy (1952), master of science in aeronautical engineering from the University of Michigan (1959), and was chosen with the second group of astronauts in 1962. He was pilot of Gemini 4 (first American to perform extravehicular activity—a spacewalk), backup command pilot for Gemini 7, and had been selected to be command module pilot for the first Apollo flight.

Clifton Curtis Williams, Jr.: Major, USMC; born September 26, 1932, Mobile, Alabama; died October 5, 1967, in the crash of a T-38 jet near Tallahassee, Florida; was married, two children.

Received bachelor of science in mechanical engineering from Auburn University (1954), and was chosen with the third group of astronauts in 1963. He was backup pilot for Gemini 10.

Donald Edward Williams; Captain, USN; born February 13, 1942, Lafayette, Indiana; married, two children. **Spaceflight: STS 51-D**

Received bachelor of science in mechanical engineering from Purdue University (1964), and was a naval aviator, Readiness Training Squadron, NAS Lemoore, California when he was chosen with the eighth group of astronauts in 1978. He piloted STS 51-D and is currently training to be the commander of STS-34, which will deploy the Galileo probe to Jupiter.

Alfred Merrill Worden: Lieutenant Colonel, USAF (Retired); born February 7, 1932, Jackson, Michigan; married, three children (by a previous marriage). **Spaceflight: Apollo 15**

Received bachelor of science degree from the U.S. Military Academy (1955), master of science degrees in astronautical/aeronautical engineering and instrumentation engineering from the University of Michigan (1963), and was chosen with the fifth group of astronauts in 1966. He was backup command module pilot for Apollo 12 and command module pilot for Apollo 15. In September 1972, Colonel Worden was assigned to NASA Ames Research Center as Director of Advanced Research and Technology. He resigned from NASA and the Air Force on September 1, 1975, and became President of the Energy Management Consulting Company. He is currently President of M.W. Aerospace Inc., an aircraft management company in Florida. He has written a book of poetry entitled *Hello Earth: Greetings from Endeavour,* and a children's book, *A Flight to the Moon.*

John Watts Young; Captain, USN (Retired); born September 24, 1930, San Francisco, California; married, two children (by a previous marriage). **Spaceflights: Gemini 3, Gemini 10, Apollo 10, Apollo 16, STS-1, STS-9**

Received bachelor of science degree in aeronautical engineering from Georgia Institute of Technology (1952) and was chosen with the second group of astronauts in 1962. He was pilot of Gemini 3, backup pilot of Gemini 6, command pilot for Gemini 10, backup command module pilot for Apollo 7, command module pilot of Apollo 10, backup commander for Apollo 13, commander for Apollo 16 (ninth man to walk on the Moon), and backup commander of Apollo 17. He retired from the Navy on September 30, 1976, and served as the chief of the astronaut office. Young was the commander of the first shuttle orbital flight test, STS-1, and commander of STS-9 (Spacelab 1). He is currently a special assistant to the Director of Johnson Space Center, but continues to be an active member of the astronaut corps.

TABLE 1-4.—SUMMARY OF NASA ASTRONAUTS

Name	Group/year chosen	Service/rank (retired)	Native State	Flight(s) [1]	Currently:
Adamson	X/1984	USA/Lt. Col.	New York	[STS-28]	Training as a MS for pending mission.
Akers	XII/1987	USAF/Major	Missouri	pending	Awaiting flight assignment.
Aldrin	III/1963	USAF/(Colonel)	New Jersey	Gemini 12 Apollo 11	Aerospace Consultant and Professor at the University of North Dakota.
Allen, A.	XII/1987	USMC/Captain	Pennsylvania	pending	Awaiting flight assignment.
Allen, J.	VI/1967	civilian	Indiana	STS-5 STS 51-A	President, Space Industries, Inc.
Anders	III/1963	USAFR/Brig. Gen.	Hong Kong	Apollo 8	Senior Executive Vice President, Aerospace, Textron Incorporated.
Apt	XI/1985	civilian	Massachusetts	[STS-37]	Training as a MS for pending mission.
Armstrong	II/1962	civilian	Ohio	Gemini 8 Apollo 11	Chairman, Computing Technologies for Aviation Incorporated.
Bagian	IX/1980	civilian	Pennsylvania	STS-29 [STS-40]	Training as a MS for pending mission.
Baker, E.	X/1984	civilian	N. Carolina	[STS-34]	Training as a MS for pending mission.
Baker, M.	XI/1985	USN/Lt. Cmdr.	Tennessee	pending	Awaiting flight assignment.
Bassett	III/1963	USAF/Major	Ohio	none	Killed in T-38 crash in February 1966.
Bean	III/1963	USN/(Captain)	Texas	Apollo 12 Skylab 3	Pursuing career as an artist.
Blaha	IX/1980	USAF/Colonel	Texas	STS-29 [STS-40]	Training for pending mission.
Bluford	VIII/1978	USAF/Colonel	Pennsylvania	STS-8 STS 61-A	Awaiting future flight assignment.
Bobko	VII/1969	USAF/(Colonel)	New York	STS-6 STS 51-D STS 51-J	Working with Grumman Corp. on space station program.
Bolden	IX/1980	USMC/Colonel	S. Carolina	STS 61-C [STS-31]	Training for pending mission.
Borman	II/1962	USAF/(Colonel)	Indiana	Gemini 7 Apollo 8	Aviation consultant in New Mexico.
Bowersox	XII/1987	USN/Lieutenant	Virginia	pending	Awaiting flight assignment.
Brand	V/1966	civilian	Colorado	Apollo-Soyuz STS-5 STS 41-B	Awaiting future flight assignment.

TABLE 1-4.—SUMMARY OF NASA ASTRONAUTS—Continued

Name	Group/year chosen	Service/rank (retired)	Native State	Flight(s) [1]	Currently:
Brandenstein	VIII/1978	USN/Captain	Wisconsin	STS-8 STS 51-G [STS-32]	Training for pending mission. Will be Commander of STS-32.
Bridges	IX/1980	USAF/Colonel	Georgia	STS 51-F	Commander, Eastern Missile and Space Center.
Brown, C.	XII/1987	USAF/Captain	N. Carolina	pending	Awaiting flight assignment.
Brown, M.	X/1984	USAF/Major	Indiana	[STS-28]	Training as a MS for pending mission.
Buchli	VIII/1978	USMC/Colonel	South Dakota	STS 51-C STS 61-A STS-29	Awaiting future flight assignment.
Bull	V/1966	USN/(Lt. Cmdr.)	Tennessee	none	Research Scientist, NASA Ames Research Center.
Cabana	XI/1985	USMC/Lt. Col.	Minnesota	pending	Awaiting flight assignment.
Cameron	X/1984	USMC/Lt. Col.	Ohio	[STS-37]	Training as a pilot for pending mission.
Carpenter	I/1959	USN/(Commander)	Colorado	Mercury-Atlas 7	Engineering consultant.
Carr	V/1966	USMC/(Colonel)	Colorado	Skylab 4	Senior Consultant, Applied Research Inc.
Carter	X/1984	USN/Captain	Georgia	[STS-33]	Training as a MS for a pending mission.
Casper	X/1984	USAF/Colonel	S. Carolina	[STS-36]	Training as pilot for pending mission.
Cernan	III/1963	USN/(Captain)	Illinois	Gemini 9 Apollo 10 Apollo 17	President, Cernan Corp., Houston, Texas.
Chaffee	III/1963	USN/Lt. Cmdr.	Michigan	none	Died in Apollo 204 fire.
Chang-Diaz	IX/1980	civilian	Costa Rica	STS 61-C [STS-34]	Training as a MS for pending mission.
Chapman	VI/1967	civilian	Australia	none	Senior Staff, Arthur D. Little, Inc.
Chilton	XII/1987	USAF/Major	California	pending	Awaiting flight assignment.
Cleave	IX/1980	civilian	New York	STS 61-B STS-30	Awaiting future flight assignment.
Coats	VIII/1978	USN/Captain	California	STS 41-D STS-29	Awaiting future flight assignment.
Collins	III/1963	USAFR/Maj. Gen	Italy	Gemini 10 Apollo 11	President, Michael Collins Associates, Washington, D.C.
Conrad	II/1962	USN(Captain)	Pennsylvania	Gemini 5 Gemini 11 Apollo 12 Skylab 2	Vice-President, International, McDonnell Douglas Corp.

Cooper	I/1959	USAF/(Colonel)	Oklahoma	Mercury-Atlas 9 Gemini 5	President, XL Inc., Los Angeles.
Covey	VIII/1978	USAF/Colonel	Arkansas	STS 51-I STS-26	Awaiting future flight assignment.
Creighton	VIII/1978	USN/Captain	Texas	STS 51-G [STS-36]	Training for pending mission. Will be Commander of STS-36.
Crippen	VII/1969	USN/Captain	Texas	STS-1 STS-7 STS 41-C STS 41-G	Deputy Director, NSTS Operations, NASA Headquarters.
Culbertson	X/1984	USN/Cmdr.	S. Carolina	pending	Awaiting flight assignment.
Cunningham	III/1963	civilian	Iowa	Apollo 7	Partner, The Capital Group, Houston, Texas.
Davis	XII/1987	civilian	Florida	pending	Awaiting flight assignment.
Duffy	XI/1985	USAF/Major	Massachusetts	pending	Awaiting flight assignment.
Duke	V/1966	USAFR/Brig. Gen.	N. Carolina	Apollo 16	Lay Minister, Duke Ministry for Christ.
Dunbar	IX/1980	civilian	Washington	STS 61-A [STS-32]	Training as a MS for pending mission.
Eisele	III/1963	USAF/(Colonel)	Ohio	Apollo 7	Died in 1987 of a heart attack.
England	VI/1967	civilian	Indiana	STS 51-F	Professor of Electrical Engineering and Computer Science, University of Michigan.
Engle	V/1966	USANG/Brig. Gen.	Kansas	STS-2 STS 51-I	Air National Guard Assistant to the Commander in Chief, U.S. Space Command.
Evans	V/1966	USN/(Captain)	Kansas	Apollo 17	Marketing Consultant
Fabian	VIII/1978	USAF/(Colonel)	Texas	STS-7 STS 51-G	Vice President, Space Systems, ANSER Inc.
Fisher, A.	VIII/1978	civilian	New York	STS 51-A	Awaiting future flight assignment.
Fisher, W.	IX/1980	civilian	Texas	STS 51-I	Awaiting future flight assignment.
Foale	XII/1987	civilian	England	pending	Awaiting flight assignment.
Freeman	III/1963	USAF/Captain	Pennsylvania	none	Killed in T-38 crash in October 1964.
Fullerton	VII/1969	USAF/Colonel	New York	STS-3 STS 51-F	Research pilot at NASA's Dryden Flight Research Facility.
Gardner, D.	VIII/1978	USN/Commander	Minnesota	STS-8 STS 51-A	U.S. Space Command, Colorado Springs, Colorado.
Gardner, G.	IX/1980	USAF/Lt. Col.	Virginia	STS-27 [STS-35]	Training as a pilot for pending mission.
Garriott	IV/1965	civilian	Oklahoma	Skylab 3 STS-9	Vice President, Space Programs, Teledyne-Brown Engineering.
Gemar	XI/1985	USA/Captain	S. Dakota	pending	Awaiting flight assignment.
Gibson, E.	IV/1965	civilian	New York	Skylab 4	With Booz, Allen and Hamilton, Inc.

TABLE 1-4.—SUMMARY OF NASA ASTRONAUTS—Continued

Name	Group/year chosen	Service/rank (retired)	Native State	Flight(s) [1]	Currently:
Gibson, R.	VIII/1978	USN/Cmdr.	New York	STS 41-B STS 61-C STS-27	Awaiting future flight assignment.
Givens	V/1966	USAF/Major	Texas	none	Died in automobile accident in June 1967.
Glenn	I/1959	USMC/(Colonel)	Ohio	Mercury-Atlas 6	U.S. Senator from Ohio.
Godwin	XI/195	civilian	Missouri	[STS-37]	Training as a MS for pending mission.
Gordon	III/1963	USN/(Captain)	Washington	Gemini 11 Apollo 12	With Astro Systems and Engineering.
Grabe	IX/1980	USAF/Colonel	New York	STS 51-J STS-30	Awaiting future flight assignment.
Graveline	IV/1965	civilian	Vermont	none	Operating private medical practice in Colchester, Vermont.
Gregory	VIII/1978	USAF/Colonel	Wash., D.C.	STS 51-B [STS-33]	Training for pending mission. Will be Commander of STS-33.
Griggs	VIII/1978	USNR/Rear Adm.	Oregon	STS 51-D	Died in private airplane crash, June 1989.
Grissom	I/1959	USAF/Lt. Col.	Indiana	Mercury-Redstone 4 Gemini 3	Died in Apollo 204 fire.
Gutierrez	X/1984	USAF/Major	New Mexico	pending	Awaiting flight assignment.
Haise	V/1966	civilian	Mississippi	Apollo 13	President, Grumman Space Station Program Support Company.
Hammond	X/1984	USAF/Major	Georgia	pending	Awaiting flight assignment.
Harbaugh	XII/1987	civilian	Ohio	pending	Awaiting flight assignment.
Hart	VIII/1978	civilian	Pennsylvania	STS 41-C	Supervisor, Military and Space Application Group, AT&T Bell Labs.
Hartsfield	VII/1969	USAF/(Colonel)	Alabama	STS-4 STS 41-D STS 61-A	Awaiting future flight assignment.
Hauck	VIII/1978	USN/Captain	California	STS-7 STS 51-A STS-26	Commander, U.S. Navy Space Systems Division.
Hawley	VIII/1978	civilian	Kansas	STS 41-D STS 61-C [STS-31]	Training as a MS for pending mission.
Henize	VI/1967	civilian	Ohio	STS 51-F	Senior Scientist, Johnson Space Center.
Henricks	XI/1985	USAF/Lt. Col.	Ohio	pending	Awaiting flight assignment.
Hieb	XI/1985	civilian	Tennessee	pending	Awaiting flight assignment.

Hilmers	IX/1980	USMC/Lt. Col.	Iowa	STS 51–J STS–26 [STS–36]	Training as a MS for pending mission.
Hoffman	VIII/1978	civilian	New York	STS 51–D [STS–35]	Training as a MS for pending mission.
Holmquest	VI/1967	civilian	Texas	none	Attorney, partner with Wood, Lucksinger and Epstein.
Irwin	V/1966	USAF/(Colonel)	Pennsylvania	Apollo 15	Chairman, High Flight Foundation.
Ivins	X/1984	civilian	Maryland	[STS–32]	Training as a MS for pending mission.
Jemison	XII/1987	civilian	Alabama	pending	Awaiting flight assignment.
Jernigan	XI/1985	civilian	Tennessee	[STS–40]	Training as a MS for pending mission.
Kerwin	IV/1965	USN/(Captain)	Illinois	Skylab 2	Chief Scientist, Space Station Programs, Lockheed Corporation.
Lee	X/1984	USAF/Major	Wisconsin	STS–30	Awaiting future flight assignment.
Leetsma	IX/1980	USN/Cmdr.	Michigan	STS 41–G [STS–28]	Training as a MS for pending mission.
Lenoir	VI/1967	civilian	Florida	STS–5	NASA Associate Administrator for Space Station.
Lind	V/1966	civilian	Utah	STS 51–B	Professor of Physics, Utah State University.
Llewellyn	VI/1967	civilian	Wales	none	Director of Engineering Computing, University of South Florida.
Lounge	IX/1980	civilian	Colorado	STS 51–I STS–26 [STS–35]	Training as a MS for pending mission.
Lousma	V/1966	USMC/(Colonel)	Michigan	Skylab 3	Consultant, Ann Arbor, Michigan.
Lovell	II/1962	USN/(Captain)	Ohio	Gemini 7 Gemini 12 Apollo 8 Apollo 13	Executive Vice President, Centel Corporation.
Low	X/1984	civilian	Ohio	[STS–32]	Training as a MS for pending mission.
Lucid	VIII/1978	civilian	China	STS 51–G [STS–34]	Training as a MS for pending mission.
Mattingly	V/1966	USN/Commodore	Illinois	Apollo 16 STS–4 STS 51–C	Director, Space Sensor Systems, U.S. Navy Space and Naval Warfare Command.
McBride	VIII/1978	USN/(Captain)	West Virginia	STS 41–G	Involved in commercial real estate ventures.
McCandless	V/1966	USN/Capt.	Massachusetts	STS 41–B [STS–31]	Training as a MS for pending mission.
McCulley	X/1984	USN/Cmdr.	California	[STS–34]	Training as a pilot for pending mission.
McDivitt	II/1962	USAF/(Brig. Gen.)	Illinois	Gemini 4 Apollo 9	Executive Vice President, Defense Electronics Operations, Rockwell Inc.
McMonagle	XII/1987	USAF/Major	Michigan	pending	Awaiting flight assignment.
McNair	VIII/1978	civilian	S. Carolina	STS 41–B	Died in STS 51–L (***Challenger***) tragedy.
Meade	XI/1985	USAF/Major	Illinois	pending	Awaiting flight assignment.

TABLE 1-4.—SUMMARY OF NASA ASTRONAUTS—Continued

Name	Group/year chosen	Service/rank (retired)	Native State	Flight(s)[1]	Currently:
Melnick	XII/1987	USCG/Cmdr.	New York	pending	Awaiting flight assignment.
Michel	IV/1965	civilian	Wisconsin	none	Professor of Astrophysics, Rice University.
Mitchell	V/1966	USN/(Captain)	Texas	Apollo 14	Chairman, Mitchell Communications Corp.
Mullane	VIII/1978	USAF/Colonel	Texas	STS 41-D STS-27 [STS-36]	Training as a MS for pending mission.
Musgrave	VI/1967	civilian	Massachusetts	STS-6 STS 51-F [STS-33]	Training as a MS for pending mission.
Nagel	VIII/1978	USAF/Colonel	Illinois	STS 51-G STS 61-A [STS-37]	Training for pending flight. Will be Commander of STS-37.
Nelson, G.	VIII/1978	civilian	Iowa	STS 41-C STS 61-C STS-26	Professor and Assistant Provost, Univ. of Washington.
O'Connor	IX/1980	USMC/Colonel	California	STS 61-B [STS-40]	Training for pending mission. Will be Commander of STS-40.
O'Leary	VI/1967	civilian	Massachusetts	none	Chairman of the Board, Institute for Security and Cooperation in Outer Space.
Onizuka	VIII/1978	USAF/Major	Hawaii	STS 51-C	Died in STS 51-L (***Challenger***) tragedy.
Oswald	XI/1985	civilian	Washington	pending	Awaiting flight assignment.
Overmyer	VII/1967	USMC/(Colonel)	Ohio	STS-5 STS 51-B	Technical Advisor to the President, Martin Marietta Space Systems Company.
Parker	VI/1967	civilian	New York	STS-9 [STS-35]	Training as a MS for pending mission.
Peterson	VII/1967	USAF/(Colonel)	Mississippi	STS-6	President, Aerospace Operations Consultants.
Pogue	V/1966	USAF/(Colonel)	Oklahoma	Skylab 4	President, William Pogue Associates, Inc.
Readdy	XII/1987	civilian	Rhode Island	pending	Awaiting flight assignment.
Reightler	XII/1987	USN/Cmdr.	Maryland	pending	Awaiting flight assignment.
Resnik	VIII/1978	civilian	Ohio	STS 41-D	Died in STS 51-L (***Challenger***) tragedy.
Richards	IX/1980	USN/Cmdr.	Florida	[STS-28]	Training as pilot for pending mission.
Ride	VIII/1978	civilian	California	STS-7 STS 41-G	Director, California Space Institute, and Professor, Univ. of Calif., San Diego.
Roosa	V/1966	USAF/(Colonel)	Colorado	Apollo 14	President, Gulf Coast Coors.

Ross	IX/1980	USAF/Lt. Col.	Indiana	STS 61–B STS–27 [STS 37]	Awaiting future flight assignment.
Runco	XII/1987	USN/Lt. Cmdr.	New York	pending	Awaiting flight assignment.
Schirra	I/1959	USN/(Captain)	New Jersey	Mercury–Atlas 8 Gemini 6 Apollo 7	Consultant, Sante Fe, California.
Schmitt	IV/1965	civilian	New Mexico	Apollo 17	Director, Nord Resources, Sunwest Financial Services.
Schweickart	III/1963	civilian	New Jersey	Apollo 9	President, Association of Space Explorers.
Scobee	VIII/1978	USAF/(Major)	Washington	STS 41–C	Died in STS 51–L (***Challenger***) tragedy.
Scott	III/1963	USAF/(Colonel)	Texas	Gemini 8 Apollo 9 Apollo 15	President, Scott Science and Technology Inc., Los Angeles.
Seddon	VIII/1978	civilian	Tennessee	STS 51–D [STS–40]	Training as a MS for pending mission.
See	II/1962	civilian	Texas	none	Died in T–38 crash in February 1966.
Shaw	VIII/1978	USAF/Lt. Col.	Michigan	STS–9 STS 61–B [STS–28]	Training for pending mission. Will be Commander of STS–28.
Shepard, A.	I/1959	USN/(Rear Adm.)	New Hampshire	Mercury-Redstone 3 Apollo 14	President, Seven-Fourteen Enterprises, Houston, Texas.
Shepard, W.	X/1984	USN/Cmdr.	Tennessee	STS–27	Awaiting future flight assignment.
Shriver	VIII/1978	USAF/Colonel	Iowa	STS 51–C [STS–31]	Training for pending mission. Will be Commander of STS–31.
Slayton	I/1959	USAF/(Major)	Wisconsin	Apollo-Soyuz	President, Space Services, Inc.
Smith	IX/1980	USN/Commander	N. Carolina	none	Died in STS 51–L (***Challenger***) tragedy.
Spring	IX/1980	USA/Lt. Colonel	Connecticut	STS 61–B	Director, U.S. Army Space Program Office.
Springer	IX/1980	USMC/Colonel	Missouri	STS–29	Awaiting future flight assignment.
Stafford	II/1962	USAF/(Lt. Gen.)	Oklahoma	Gemini 6 Gemini 9 Apollo 10 Apollo-Soyuz	Vice Chairman, Stafford, Burke and Hecker Inc, Alexandria, Virginia.
Stewart	VIII/1978	USA/Brig. Gen.	Wash., D.C.	STS 41–B STS 51–J	Deputy Commander, U.S. Strategic Defense Command, Huntsville, Alabama.
Sullivan	VIII/1978	civilian	New Jersey	STS 41–G [STS–31]	Training as a MS for pending mission.
Swigert	V/1966	civilian	Colorado	Apollo 13	Died of cancer in 1982.
Thagard	VIII/1978	civilian	Florida	STS–7 STS 51–B STS–30	Awaiting future flight assignment.

TABLE 1–4.—SUMMARY OF NASA ASTRONAUTS—Continued

Name	Group/year chosen	Service/rank (retired)	Native State	Flight(s) [1]	Currently
Thorne	XI/1985	USN/Lt. Cmdr.	West Germany	none	Died in 1986 airplane crash.
Thornton, K.	X/1984	civilian	Alabama	[STS–33]	Training as a MS for pending mission.
Thornton, W.	VI/1967	civilian	N. Carolina	STS–8 STS 51–B	Awaiting future flight assignment.
Thuot	XI/1985	USN/Lt. Cmdr.	Connecticut	[STS–36]	Training as a MS for pending mission.
Truly	VII/1969	USN/Vice Adm.	Mississippi	STS–2 STS–8	Will become NASA Administrator on July 1, 1989.
van Hoften	VIII/1978	civilian	California	STS 41–C STS 51–I	Manager of Space Programs, Bechtel National, Inc.
Veach	X/1984	civilian	Illinois	pending	Awaiting flight assignment.
Voss	XII/1987	USA/Major	Alabama	pending	Awaiting flight assignment.
Walker, D.	VIII/1978	USN/Captain	Georgia	STS 51–A STS–30	Awaiting future flight assignment.
Weitz	V/1966	USN/(Captain)	Pennsylvania	Skylab 2 STS–6	Awaiting future flight assignment.
Wetherbee	X/1984	USN/Lt. Cmdr.	New York	[STS–32]	Training as a pilot for pending mission
White	II/1962	USAF/Lt. Colonel	Texas	Gemini 4	Died in Apollo 204 fire.
Williams, C.	III/1963	USMC/Major	Alabama	none	Died in October 1967 T–38 crash.
Williams, D.	VIII/1978	USN/Captain	Indiana	STS 51–D [STS–34]	Training for pending mission. Will be Commander of STS–32.
Worden	V/1966	USAF/(Lt. Col.)	Michigan	Apollo 15	President, M.W. Aerospace Inc.
Young	II/1962	USN/(Captain)	California	Gemini 3 Gemini 10 Apollo 10 Apollo 16 STS–1 STS–9	Awaiting future flight assignment.

---

[1] Flights in brackets are currently scheduled to be flown with the crews indicated.

Astronauts in **boldface** are currently active. Others are retired or deceased as noted.
USA = United States Army, USAF = United States Air Force, USAFR = United States Air Force Reserve, USANG = United States Air National Guard, USCG = United States Coast Guard, USMC = United States Marine Corps, USN = United States Navy, USNR = United States Naval Reserve.
STS = Space Transportation System (space shuttle), MS = mission specialist.

TABLE 1–5.—NASA ASTRONAUT CUMULATIVE SPACE TIME

Name	Flight(s)	Total time in space (hr:min)	EVA		
			Space	Lunar	Total
Aldrin	Gemini 12	289:54	5:30	2:48	8:18
	Apollo 11				
Allen, J.	STS–5	313:59	10:43		10:43
	STS 51–A				
Anders	Apollo 8	147:01			
Armstrong	Gemini 8	206:00		2:48	2:48
	Apollo 11				
Bagian	STS–29	119:39			
Bean	Apollo 12	1671:45	2:41	7:46	10:27
	Skylab 3				
Blaha	STS–29	119:39			
Bluford	STS–8	313:53			
	STS 61–A				
Bobko	STS–6	386:06			
	STS 51–D				
	STS 51–J				
Bolden	STS 61–C	146:04			
Borman	Gemini 7	477:36			
	Apollo 8				
Brand	ASTP	530:58			
	STS–5				
	STS 41–B				
Brandenstein	STS–8	314:48			
	STS 51–G				
Bridges	STS 51–F	190:45			
Buchli	STS 51–C	361:56			
	STS 61–A				
	STS–29				
Carpenter	MA–7	4:56			
Carr	Skylab 4	2017:16	15:51		15:51
Cernan	Gemini 9	566:16	2:07	22:04	24:11
	Apollo 10				
	Apollo 17				
Chang-Diaz	STS 61–C	146:04			
Cleave	STS 61–B	262:02			
	STS–30				
Coats	STS 41–D	264:36			
	STS–29				
Collins	Gemini 10	266:06	1:27		1:27
	Apollo 11				
Conrad	Gemini 5	1179:38	4:59	7:46	12:45
	Gemini 11				
	Apollo 12				
	Skylab 2				
Cooper	MA–9	225:15			
	Gemini 5				
Covey	STS 51–I	267:18			
	STS–26				
Creighton	STS 51–G	169:39			
Crippen	STS–1	565:49			
	STS–7				
	STS 41–C				
	STS 41–G				
Cunningham	Apollo 7	260:09			
Duke	Apollo 16	265:51	1:24	20:14	21:38
Dunbar	STS 61–A	168:44			
Eisele	Apollo 7	260:09			
England	STS 51–F	190:45			

TABLE 1-5.—NASA ASTRONAUT CUMULATIVE SPACE TIME—Continued

Name	Flight(s)	Total time in space (hr:min)	EVA		
			Space	Lunar	Total
Engle	STS-2 STS 51-I	224:31			
Evans	Apollo 17	301:52	1:06		1:06
Fabian	STS-7 STS 51-G	316:03			
Fisher, A.	STS 51-A	191:45			
Fisher, W.	STS 51-I	170:18	11:38		11:38
Fullerton	STS-3 STS 51-F	382:50			
Gardner, D.	STS-8 STS 51-A	336:54	10:43		10:43
Gardner, G.	STS-27	105:06			
Garriott	Skylab 3 STS-9	1674:56	13:42		13:42
Gibson, E.	Skylab 4	2017:16	15:22		15:22
Gibson, R.	STS 41-B STS 61-C STS-27	442:26			
Glenn	MA-6	4:55			
Gordon	Gemini 11 Apollo 12	315:53	2:41		2:41
Grabe	STS 51-J STS-30	194:44			
Gregory	STS 51-B	168:09			
Griggs	STS 51-D	167:55	3:00		3:00
Grissom	MR-4 Gemini 3 (Apollo 204)*	5:09			
Haise	Apollo 13	142:55			
Hart	STS 41-C	167:40			
Hartsfield	STS-4 STS 41-D STS 61-A	482:52			
Hauck	STS-7 STS 51-A STS-26	435:09			
Hawley	STS 41-D STS 61-C	291:01			
Henize	STS 51-F	190:45			
Hilmers	STS 51-J STS-26	194:47			
Hoffman	STS 51-D	167:55	3:00		3:00
Irwin	Apollo 15	295:12	:38	18:35	19:13
Kerwin	Skylab 2	672:50	3:23		3:23
Lee	STS-30	96:57			
Leestma	STS 41-G	197:24	3:30		3:30
Lenoir	STS-5	122:14			
Lind	STS 51-B	168:09			
Lounge	STS 51-I STS-26	267:18			
Lousma	Skylab 3 STS-3	1619:14	11:01		11:01
Lovell	Gemini 7 Gemini 12 Apollo 8 Apollo 13	715:06			
Lucid	STS 51-G	169:39			
Mattingly	Apollo 16 STS-4 STS 51-C	508:35	1:24		1:24
McBride	STS 41-G	197:24			

TABLE 1–5.—NASA ASTRONAUT CUMULATIVE SPACE TIME—Continued

Name	Flight(s)	Total time in space (hr:min)	EVA		
			Space	Lunar	Total
McCandless	STS 41–B	191:16			
McDivitt	Gemini 4 Apollo 9	338:57			
McNair	STS 41–B (STS 51–L)*	191:16	11:30		11:30
Mitchell	Apollo 14	216:02		9:23	9:23
Mullane	STS 41–D STS–27	250:03			
Musgrave	STS–6 STS 51–F	311:09	3:52		3:52
Nagel	STS 51–G STS 61–A	338:23			
Nelson, G.	STS 41–C STS 61–C STS–26	410:44	10:30		10:30
O'Connor	STS 61–B	165:05			
Onizuka	STS 51–C (STS 51–L)*	73:33			
Overmyer	STS–5 STS 51–B	290:23			
Parker	STS–9	247:47			
Peterson	STS–6	120:24	3:52		3:52
Pogue	Skylab 4	2017:16	13:37		13:37
Resnik	STS 41–D (STS 51–L)*	144:57			
Ride	STS–7 STS 41–G	343:48			
Roosa	Apollo 14	216:02			
Ross	STS 61–B STS–27	270:11	12:12		12:12
Schirra	MA–8 Gemini 6 Apollo 7	295:13			
Schmitt	Apollo 17	301:52	1:06	22:04	23:10
Schweickart	Apollo 9	241:01	1:07		1:07
Scobee	STS 41–C (STS 51–L)*	167:40			
Scott	Gemini 8 Apollo 9 Apollo 15	546:54	1:01	19:08	20:09
Seddon	STS 51–D	167:55			
Shaw	STS–9 STS 61–B	412:52			
Shepard, A.	MR–3 Apollo 14	216:17		9:23	9:23
Shepard, W.	STS–27	105:06			
Shriver	STS 51–C	73:33			
Slayton	ASTP	217:28			
Spring	STS 61–B	165:05	12:12		12:12
Springer	STS–29	119:39			
Stafford	Gemini 6 Gemini 9 Apollo 10 ASTP	507:43			
Stewart	STS 41–B STS 51–J	289:03	11:30		11:30
Sullivan	STS 41–G	197:24	3:30		3:30
Swigert	Apollo 13	142:55			
Thagard	STS–7 STS 51–B STS–30	411:30			

TABLE 1-5.—NASA ASTRONAUT CUMULATIVE SPACE TIME—Continued

Name	Flight(s)	Total time in space (hr:min)	EVA Space	EVA Lunar	EVA Total
Thornton, W.	STS-8 STS 51-B	313:18			
Truly	STS-2 STS-8	199:22			
van Hoften	STS 41-C STS 51-I	337:58	22:08		22:08
Walker, D.	STS 51-A STS-30	288:42			
Weitz	Skylab 2 STS-6	793:14	2:11		2:11
White	Gemini 4 (Apollo 204)*	97:56	0:36		0:36
Williams, D.	STS 51-D	167:55			
Worden	Apollo 15	295:12	0:38		0:38
Young	Gemini 3 Gemini 10 Apollo 10 Apollo 16 STS-1 STS-9	835:42	20:14	20:14	
114 NASA Astron.	56 Missions	40,840:09	237:22	162:13	399:35

Includes only NASA astronauts. For other Americans, and foreigners, launched on U.S. space shuttle flights as payload specialists or passengers, see Table 3-2.

MA=Mercury Atlas; MR=Mercury Redstone; ASTP=Apollo Soyuz Test Project; STS=Space Transportation System (the space shuttle).

* Apollo 204 was not a spaceflight, but three astronauts were killed in the Apollo 204 capsule during pre-launch tests on January 27, 1967. STS 51-L was the fatal flight of the space shuttle Challenger that killed 7 astronauts on January 28, 1986. Although neither is counted in the total number of U.S. spaceflights nor the total number of flights made by the astronauts involved, they are included in this list for completeness for those astronauts who had flown other missions. In addition to Gus Grissom and Ed White, Roger Chaffee was killed in the Apollo 204 fire. In addition to Ron McNair, Ellison Onizuka, Judy Resnik, and Dick Scobee, Mike Smith died in the Challenger tragedy. Two non-NASA astronauts (Gregory Jarvis, a payload specialist from Hughes Aircraft, and Christa McAuliffe, "teacher-in-space,") died on Challenger. Their biographies are in Chapter 3.

CHAPTER TWO—THE X-15, X-20 DYNA-SOAR, ANDMANNED ORBITING LABORATORY PROGRAMS

In addition to the NASA astronaut program, the United States has had three other programs in which participants could have achieved the astronaut rating, using the standard of having flown above 80 kilometers (50 miles or 264,000 feet). These were the NASA/Navy/Air Force X–15 program from 1952-1969; the Air Force/NASA X–20 Dyna-Soar program from 1956–1963; and the Department of Defense Manned Orbiting Laboratory program from 1963–1969. Only the X–15 actually proceeded through the flight testing phase into operational status before the programs were each cancelled in turn.

A. PROGRAM DESCRIPTIONS

X–15

The X–15 was a sophisticated research aircraft that would fly at hypersonic speeds (over 7,200 kilometers per hour or 4,500 miles per hour) as well as attain high altitudes (over 107 kilometers or 350,000 feet) to provide inflight information and data on aerodynamics, structures, flight controls and the physiological aspects of high-speed, high-altitude flight. The joint NASA/Navy/Air Force project had its origins in the summer of 1952 when the National Advisory Committee for Aeronautics (NACA, the predecessor agency to NASA) directed its laboratories to study concepts of very high altitude supersonic flight, the problems associated with it and methods for fully exploring the problem areas.

The flight research program for the X–15 consisted of a series of progressive steps to higher speeds and higher altitudes to obtain new data or confirm theoretical or wind tunnel data on characteristics of an airplane performing in a very advanced regime. The first X–15 was completed and moved to Edwards Air Force Base in October 1958. On June 8, 1959, pilot Scott Crossfield made the first powerless glide flight in the plane. Three months later he completed the first powered flight. During the nine years the X–15 was flown (1959–1968), 199 flights were completed. The highest altitude was 354,200 feet (108 kilometers) by Joseph Walker on August 22, 1963, while the fastest speed recorded was mach 6.70 (7,270 kilometers or 4,520 miles per hour) by Pete Knight on October 3, 1967. Of the twelve men who flew the X–15 (Adams, Armstrong, Crossfield, Dana, Engle, Knight, McKay, Petersen, Rushworth, Thompson, Walker and White), eight (Adams, Dana, Engle, Knight, McKay, Rushworth, Walker and White) achieved the astronaut rating by flying above 80 kilometers. One pilot, Adams, was killed while flying the X–15.

X–20 DYNA–SOAR

The Dyna-Soar was a joint Air Force/NASA project aimed at development of a small, piloted glider which could be boosted into space flight and which would be capable of maneuverable reentry from orbit to a conventional controlled landing. Primarily a military space research vehicle, the Dyna-Soar was designed to achieve orbital velocity and thereby be able to explore the problems and conditions of hypersonic flight beyond the range of the X–15. The project was initiated in 1956, and six pilots were chosen on September 20, 1962 (Crews, Gordon, Knight, Rogers, Thompson and Wood), but when the Manned Orbiting Laboratory program began in 1963, the Air Force and NASA decided to terminate the X–20. It had limited utility as an in-space test facility, and the Defense Department believed that exploration of the hypersonic flight regime and development of maneuverable reentry and recovery techniques could be more economically conducted in a program of lifting reentry vehicles.

MANNED ORBITING LABORATORY (MOL)

The Department of Defense Manned Orbiting Laboratory program originated in 1963. The program was first conceived as a means to determine the military usefulness of people in space. After the initiation of the MOL program, study by the Air Force and Navy resulted in broader program goals and a wider definition of areas of principal interest. MOL was to: (a) learn more about what people could do in space and how that ability could be used for defense purposes; (b) develop the technology and equipment which would help advance both piloted and automated space flight; and (c) experiment with this technology and equipment.

MOL was to be equipped to accommodate two men in orbit for thirty days. The Department of Defense selected a total of seventeen astronauts for the program. All were military test pilots and graduates of the Aerospace Research Pilot School at Edwards Air Force Base, California. They were selected in three groups: Group I, November 12, 1965, 8 chosen (Adams, Crews, Finley, Lawyer, Macleay, Neubeck, Taylor and Truly); Group II, June 17, 1966, 5 chosen (Bobko, Crippen, Fullerton, Hartsfield, and Overmyer); and Group III, June 30, 1967, 4 chosen (Abrahamson, Herres, Lawrence, and Peterson).

The Department of Defense cancelled the MOL program on June 10, 1969. Among the contributing factors were the immediate need to significantly reduce the DOD budget and the continuing large annual investments which would have been necessary to sustain program progress. DOD tried to assure useful application of a significant portion of the investment in MOL by transferring MOL technology and hardware to laboratories, NASA, and other government agencies. In addition, some of the MOL astronauts transferred to the NASA astronaut group (Bobko, Crippen, Fullerton, Hartsfield, Overmyer, Peterson and Truly).

B. BIOGRAPHIES OF X-15, X-20 DYNA-SOAR AND MOL ASTRONAUTS

James A. Abrahamson, MOL; Lieutenant General, USAF (Retired); born May 19, 1933, Inglewood, California; married, two children (by a previous marriage).

Received bachelor of science degree in aeronautical engineering from the Massachusetts Institute of Technology, master of science in aerospace engineering from the University of Oklahoma, and was chosen for the MOL Program in 1967 (Group III). After MOL was canceled, he became a staff member of the National Aeronautics and Space Council. When the Council was dissolved in 1973, he returned to active duty with the Air Force and became Inspector General, Air Force Systems Command at Andrews Air Force Base, Maryland. He was the Deputy Chief of Staff, Air Force Systems Command, Wright Patterson Air Force Base, Ohio. He was the Associate Administrator for Space Transportation Systems at NASA (1981–1984). Most recently, Abrahamson was Director of the Strategic Defense Initiative Organization. He is now retired from the Air Force.

Michael James Adams, MOL, X-15; Major, USAF; born May 5, 1930, Sacramento, California; died November 15, 1967, near Edwards Air Force Base, California, in an X-15 crash; was married, three children.

Received bachelor of science degree in aeronautical engineering from Oklahoma University (1958) and was chosen for the MOL program in 1965 (Group I). The next year he transferred to the X-15 program, and made a total of seven flights. On his last flight, he attained an altitude of 266,000 feet (81.1 kilometers) thus achieving the astronaut title.

Neil Alden Armstrong, X-15, NASA.
Biography under NASA astronauts.

Karol Joseph Bobko, MOL, NASA.
Biography under NASA astronauts.

Albert H. Crews, Jr., X-20 Dyna-Soar, MOL; Colonel (Retired) USAF; born March 23, 1929, El Dorado, Arkansas; married, three children.

Received bachelor of science degree in chemical engineering from the University of Southern Louisiana (1950), master of science in aeronautical engineering from the Air Force Institute of Technology, and was named to pilot the X-20 Dyna-Soar in 1962. He was chosen for the MOL program in 1965 (Group I), and after its cancellation, transferred to the NASA Flight Crew Operations directorate at Johnson Space Center (JSC), Houston, Texas. Currently, Crews is a technical assistant for aircraft operations at JSC.

Robert Laurel Crippen, MOL, NASA.
Biography under NASA Astronauts.

Albert Scott Crossfield, X–15; civilian; born October 2, 1921, Berkeley, California; married, six children.

Received bachelor of science degree from the University of Washington (1949), master of science in aeronautical engineering from the University of Washington (1955), and joined the X–15 program in 1958. He made 14 flights of the X–15, including the first glide flight and the first powered flight, reaching an altitude of 81,200 feet (24.8 kilometers). When the X–15 program was turned over to NASA and the Air Force in 1960, he continued at North American Aviation. Crossfield also directed research and development programs for Eastern Airlines, and currently is a staff member with the Committee on Science, Space, and Technology, U.S. House of Representatives. His book, *Always Another Dawn,* is about his experiences as a test pilot and the X–15 program.

William Harvey Dana, X–15; civilian; born November 3, 1930, Pasadena, California; married, four children.

Received bachelor of science degree from the U.S. Military Academy (1952), master of science in aeronautical engineering from the University of Southern California (1958), was an Air Force pilot, and joined the X-15 program in 1965. He made 16 flights of the X–15 reaching an altitude of 310,000 feet, thus qualifying for the astronaut title. Since 1986, he has been the Chief Pilot at NASA's Dryden Flight Research Center, Edwards Air Force Base, California.

Joe Henry Engle, X-15, NASA.
Biography under NASA astronauts.

John Lawrence Finley, MOL; Captain, USN (Retired); born December 22, 1935, Winchester Massachusetts; single, two children.

Received bachelor of science degree from the U.S. Naval Academy (1957) and was chosen for the MOL program in 1965 (Group I). He was reassigned, at his own request, to operational flying duty with the Navy before the end of the MOL program. He retired from the Navy in May 1980. Currently he is working in flight operations at the Federal Express Corp.

Charles Gordon Fullerton, MOL, NASA.
Biography under NASA astronauts.

Henry C. Gordon, X–20, Dyna-Soar; Colonel, USAF (Retired); born December 23, 1925, Valparaiso, Indiana; married, four children.

Received bachelor of science degree in aeronautical engineering from Purdue University (1950) and was chosen to pilot the X–20 Dyna-Soar while assigned to the Air Force Flight Test Center at Edwards Air Force Base, California. When the program was cancelled, he remained on active duty with the Air Force, and is now retired.

Henry Warren Hartsfield, Jr., MOL, NASA.
Biography under NASA astronauts.

Robert Tralles Herres, MOL; General, USAF; born December 1, 1932, Denver, Colorado; married, three children.

Received bachelor of science degree from the U.S. Naval Academy (1953), master of science in electrical engineering from the Air Force Institute of Technology, master of science in public administration from George Washington University, and was chosen for the MOL program in 1967 (Group III). After cancellation of the program, he returned to flight duty with the Air Force, and was Commander, Air Force Communications Command. He was then the Director of Command, Control, and Communications Systems in the Office of the Joint Chiefs of Staff. In 1984, he was appointed to the position of Commander in Chief (CINC) of NORAD and the U.S. Space Command. He was then named Vice Chairman of the Joint Chiefs of Staff, an assignment which was renewed in 1989.

William "Pete" J. Knight, X–20 Dyna-Soar, X–15; Colonel, USAF (Retired); born November 18, 1929, Noblesville, Indiana; married, two children.

Received bachelor of science in aeronautical engineering from the Air Force Institute of Technology (1958), and was chosen for the X–20 Dyna-Soar program in 1962. When the program was cancelled, he remained an experimental test pilot at Edwards Air Force Base, California. Colonel Knight was assigned to the X–15 program in 1964 and made a total of 16 flights, reaching an altitude of 280,500 feet (85.5 kilometers), thereby achieving the astronaut title. He also recorded the fastest speed during the X–15 program: Mach 6.70 (4520 miles per hour or 7,270 kilometers per hour) on October 3, 1967. Col. Knight was Vice Commander, Air Force Test Center, Edwards AFB, California until retirement in 1982. He is currently a city councilman in Palmdale, California.

Robert Henry Lawrence, Jr., MOL; Major, USAF; born October 2, 1935, Chicago, Illinois; died December 8, 1967, in the crash of an F-104 at Edwards Air Force Base, California; was married, one child.

Received bachelor of science degree in chemistry from Bradley University (1956), doctorate in nuclear chemistry from Ohio State University (1965), and was chosen for the MOL program in 1967 (Group III).

U.S.
U.S.
LAWYER

Richard E. Lawyer, MOL; Colonel, USAF (Retired); born November 8, 1932, Los Angeles, California; married, three children.

Received bachelor of science degree in aeronautical engineering from the University of California (1955) and was chosen for the MOL program in 1965 (Group I). After MOL was cancelled, he returned to USAF flight duty to include combat. At the time of his retirement, he was the Deputy Commander, Operations, Tactical Air War Center, Eglin AFB, Florida.

Lachlan Macleay, MOL; Colonel, USAF (Retired); born June 13, 1931, St. Louis, Missouri; married, three children.

Received bachelor of science degree from the U.S. Naval Academy (1954) and was chosen for the MOL program in 1965 (Group I). After the program was cancelled, he returned to flight duty. Colonel Macleay retired from the Air Force on May 1, 1978.

John B. McKay, X–15; civilian; born December 8, 1922, Portsmouth, Virginia; died April 27, 1975, of complications from injuries suffered in a 1962 X–15 crash, Lancaster, California; was married, eight children.

Flew as a Navy pilot in World War II, received bachelor of science degree from Virginia Polytechnic Institute (1950) and became a test pilot and aeronautical research engineer at the NASA Flight Research Center, Edwards, California, specializing in high-speed flight research. He joined the X–15 program in 1960 and made 29 flights of the aircraft, reaching an altitude of 295,600 feet (90.1 kilometers), thus qualifying for the astronaut title.

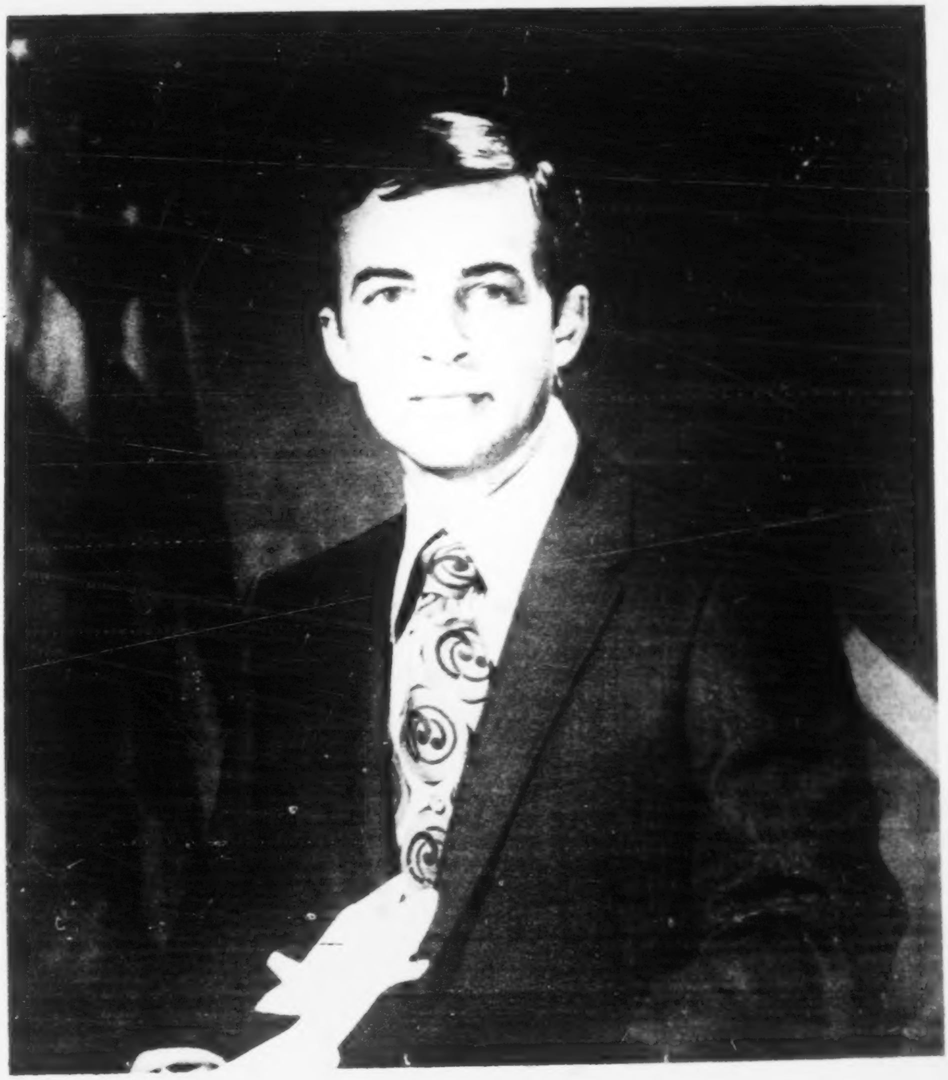
Francis Gregory Neubeck, MOL; Colonel, USAF (Retired); born April 11, 1932, Washington, D.C.; married, one child.

Received bachelor of science degree from the U.S. Naval Academy (1955) and was chosen for the MOL program in 1965 (Group I). When MOL was cancelled he returned to flight duty with the Air Force. He was Vice Commander, Tactical Air War Center, Eglin AFB, Florida, until his retirement. He is currently a technical consulting engineer in Florida.

Robert Franklyn Overmyer, MOL, NASA.
Biography under NASA astronauts.

Forrest Silas Petersen; X–15; Vice Admiral, USN (Retired); born May 16, 1922, Holdrege, Nebraska; married, three children.

Received bachelor of science degree from the U.S. Naval Academy (1944), bachelor of science in aerospace engineering from the U.S. Naval Postgraduate School (1952), master of science in engineering from Princeton University (1953), and joined the X–15 program in 1958. He made five flights of the X–15, reaching an altitude of 101,800 feet (31 kilometers). Since leaving the X–15 program in 1962, he has been Vice Chief of Naval Material; Deputy Chief of Naval Operations for Air Warfare; and Commander, Naval Air Systems Command, Department of the Navy, Washington, D.C. He retired from the Navy in May 1980.



Donald Herod Peterson, MOL, NASA.
Biography under NASA astronauts.

Russell L. Rogers, X-20 Dyna-Soar; Major, USAF; born April 12, 1928, Lawrence, Kansas; died September 13, 1967, in an F-105 explosion near Kadena Air Force Base, Okinawa; was married, four children.

Received bachelor of science degree in aeronautical engineering from the University of Colorado (1958) and was an experimental flight test pilot for the Air Force Test Center when chosen to pilot the X-20 Dyna-Soar. After the program was cancelled, he returned to active flight duty with the Air Force.

RUSHWORTH
U.S.

Robert A. Rushworth, X–15; Major General, USAF (Retired); born October 9, 1924, Madison, Maine; married, one child.

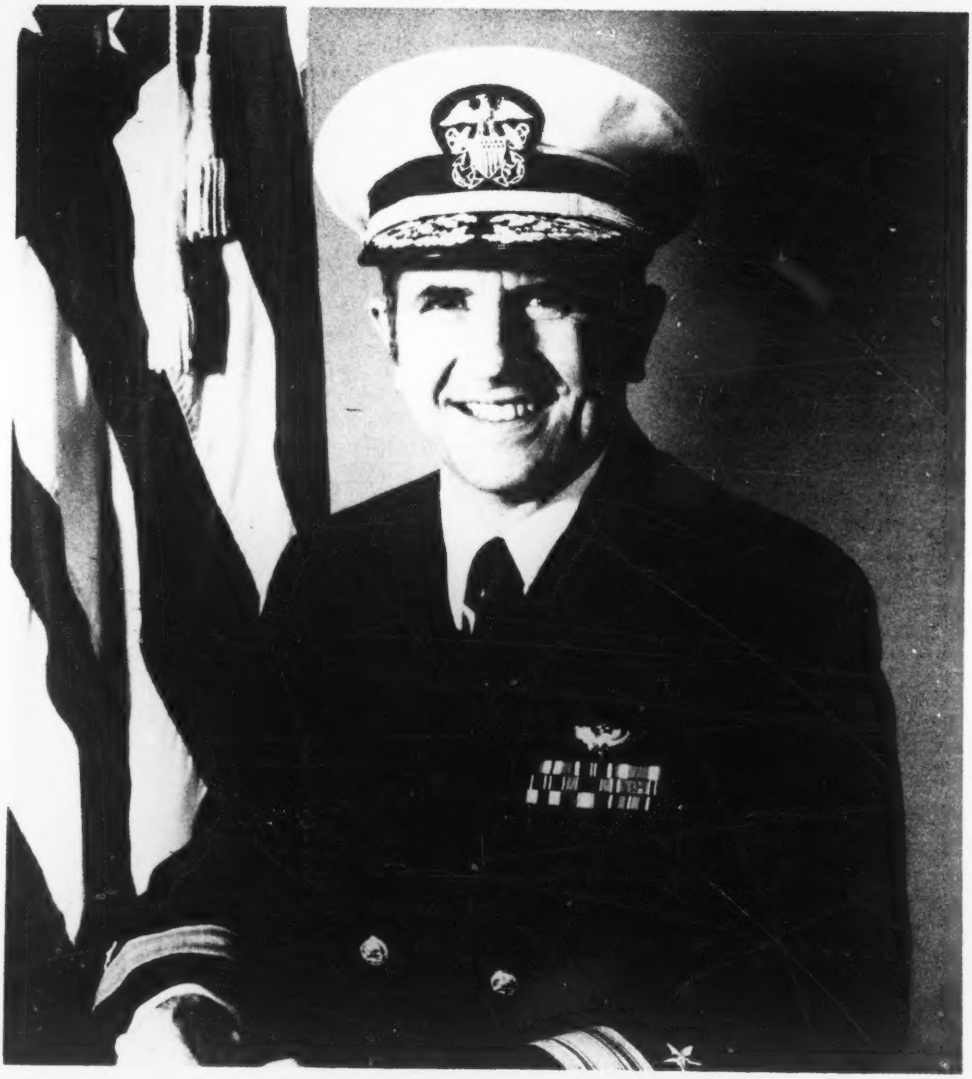
Received mechanical engineering degree from the University of Maine (1951), bachelor of science in aeronautical engineering from the Air Force Institute of Technology (1954), and was selected as an X–15 pilot in 1958. He made the greatest number of X–15 flights (34), reaching an altitude of 285,000 feet (86.9 kilometers), thus achieving the astronaut title. General Rushworth left the X–15 program in 1966 and since that time has been Commander of the Air Force Flight Test and Evaluation Center at Kirtland Air Force Base; and was Vice Commander, Aeronautical Systems Division, Air Force Systems Command, Wright Patterson Air Force Base, Ohio, until his retirement.

James M. Taylor, MOL; Lieutenant Colonel, USAF; born November 27, 1930, Stamps, Arkansas; died September 4, 1970 in the crash of a T-38 jet near Palmdale, California; was married, three children.

Received associate of arts degree at Southern State University (1950), bachelor of science in electrical engineering at the University of Michigan (1959), and was chosen for the MOL program in 1965 (Group I). He returned to flight duty with the Air Force when MOL was cancelled, and was an instructor at the Test Pilot School, Edwards Air Force Base, California, at the time of his death.

Milton O. Thompson, X-20 Dyna-Soar, X-15; civilian; born May 4, 1926, Crookston, Minnesota; married, five children.

Flew as a Navy pilot during World War II, received bachelor of science degree in engineering from the University of Washington (1953), and was the only civilian chosen to fly the X-20 Dyna-Soar. With that program's cancellation, he was assigned to the X-15, and made 14 flights from 1963 to 1965 reaching an altitude of 214,000 feet (65.3 kilometers). He was the first person to fly a lifting body (wingless craft which obtains lift from its shape) in August 1963. In the fall of 1966, Mr. Thompson became the Director of Research Projects, NASA Dryden Flight Research Center, Edwards, California, and was later Chief Engineer of NASA's Ames-Dryden Flight Research Facility. He is currently the Associate Director of NASA's Dryden facility.

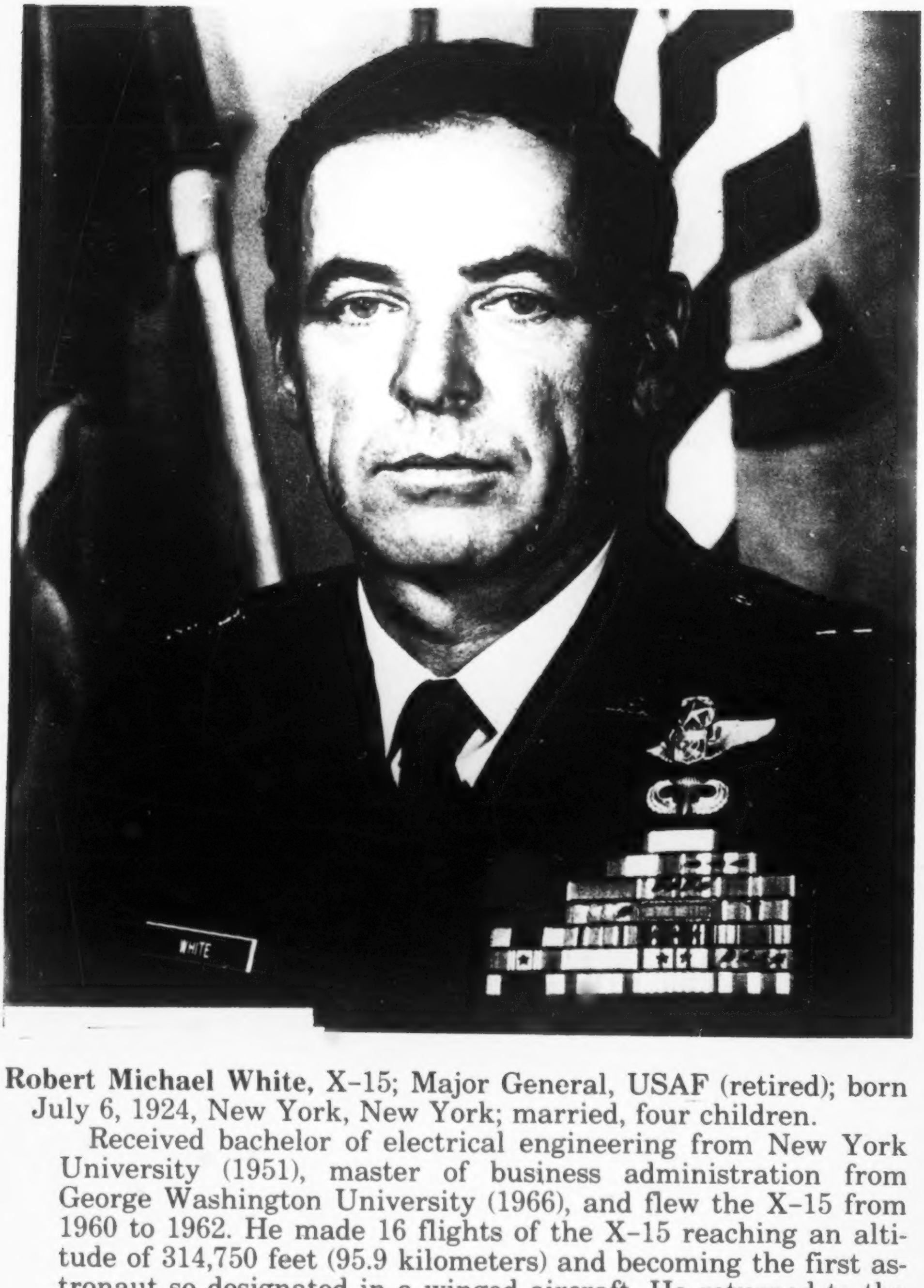


Richard Harrison Truly, MOL, NASA.
Biography under NASA astronauts.

THE VALUE OF WHICH HAS BEEN THOROUGHLY DEMONSTRATED
BY ACTUAL USE DURING THE PRECEDING YEAR

Joseph Albert Walker, X–15; civilian; born February 20, 1921, Washington, Pennsylvania; died June 8, 1966, in a mid-air collision between the F–104 he was piloting and an XB–70; was married, four children.

Received bachelor of arts degree in physics from Washington and Jefferson College (1942), became an Air Force pilot during World War II, and flew the X–15 from 1960 to 1963. He made the first X–15 research flight on March 25, 1960, and subsequently made 24 more X–15 flights, reaching the highest altitude attained during the program (354,200 feet, or 108 kilometers), thereby qualifying for the astronaut title.



Robert Michael White, X–15; Major General, USAF (retired); born July 6, 1924, New York, New York; married, four children.

Received bachelor of electrical engineering from New York University (1951), master of business administration from George Washington University (1966), and flew the X–15 from 1960 to 1962. He made 16 flights of the X–15 reaching an altitude of 314,750 feet (95.9 kilometers) and becoming the first astronaut so designated in a winged aircraft. He returned to the Air Force and was Chief of Staff, 4th Allied Tactical Air Force, Europe. He retired from the Air Force February 1, 1981, and currently resides in Heidelberg, West Germany.

James W. Wood, X-20 Dyna Soar; Colonel, USAF (Retired); born August 9, 1924, Paragould, Arkansas; married, three children.

Received bachelor of science degree in aeronautical engineering from the Air Force Institute of Technology (1956) and was an experimental flight test pilot at the Air Force Flight Test Center when named to pilot the X-20 Dyna-Soar. After the program was cancelled, he remained on active duty with the Air Force. Colonel Wood was Commander, Test Operations, Edwards Air Force Base, California, and is currently retired.

TABLE 2-1.—SUMMARY OF X-15, X-20 DYNA-SOAR AND MOL ASTRONAUTS

Name	Program	Group/year Chosen	Service/rank (retired)	Native State	Comments:
Abrahamson	MOL	III/1967	USAF/(Lt. Gen.)	California	Served as NASA Associate Administrator for Space Flight and Director of the Strategic Defense Initiative Organization.
Adams	MOL	I/1965	USAF/Major	California	Killed in the crash of the X-15 in which he reached an altitude of 266,000 feet, thus achieving the astronaut rating. Completed 7 X-15 flights in all.
	X-15	1966			
Armstrong	X-15	[1] 1958	civilian	Ohio	Completed seven X-15 flights (attaining an altitude of 207,500 feet), and then transferred to the NASA astronaut program (see Table 1-4).
Bobko	MOL	II/1966	USAF/(Colonel)	New York	Transferred to the NASA astronaut program (see Table 1-4).
Crews	X-20	I/1962	USAF/(Colonel)	Arkansas	Currently Technical Assistant for Aircraft Operations, Johnson Space Center.
	MOL	I/1965			
Crippen	MOL	II/1966	USN/Captain	Texas	Transferred to the NASA astronaut program (see Table 1-4).
Crossfield	X-15	1958	civilian	California	Completed 14 X-15 flights, including the first glide flight and first powered flight (attaining an altitude of 81,200 feet). Currently a staff member of the Committee on Science, Space and Technology, U.S. House of Representatives.
Dana	X-15	1965	civilian	California	Completed 16 X-15 flights (attaining an altitude of 306,000 feet) and achieved astronaut rating. Currently Chief Pilot at NASA's Dryden Flight Research Facility.
Engle	X-15	1963	USANG/Brig. Gen.	Kansas	Completed 16 X-15 flights and earned astronaut rating (attaining an altitude of 280,600 feet). Transferred to NASA astronaut program.
Finley	MOL	I/1965	USN/(Captain)	Texas	Currently with Federal Express, Inc.
Fullerton	MOL	II/1966	USAF/Colonel	New York	Transferred to NASA astronaut program (see Table 1-4).
Gordon	X-20	I/1962	USAF/(Colonel)	Indiana	Now retired from the Air Force.
Hartsfield	MOL	II/1966	USAF/(Colonel)	Alabama	Transferred to the NASA astronaut program (see Table 1-4).
Herres	MOL	III/1967	USAF/General	Colorado	Currently, Vice-Chairman, Joint Chiefs of Staff.
Knight	X-20	I/1962	USAF/(Colonel)	Indiana	Completed 16 X-15 flights and achieved an astronaut rating (reaching an altitude of 280,500 feet). Also attained the highest X-15 speed (4,520 miles/7270 kilometers per hour). Now retired from the Air Force.
Lawrence	MOL	III/1967	USAF/Major	Illinois	Killed in an F-104 crash in December 1967.
Lawyer	MOL	I/1965	USAF/(Colonel)	California	Now retired from the Air Force.
Macleay	MOL	I/1965	USAF/(Colonel)	Missouri	Now retired from the Air Force.
McKay	X-15	1960	civilian	Virginia	Completed 29 X-15 flights and earned astronaut rating after attaining an altitude of 295,600 feet. Died on April 27, 1985 from injuries suffered in a 1962 X-15 crash.
Neubeck	MOL	I/1965	USAF/(Colonel)	Wash., D.C.	Currently a consulting engineer in Florida.
Overmyer	MOL	II/1966	USMC/(Colonel)	Ohio	Transferred to the NASA astronaut program (see Table 1-4).
Petersen	X-15	1958	USN/(V. Adm.)	Nebraska	Now retired from the Navy.
Peterson	MOL	III/1967	USAF/(Colonel)	Mississippi	Transferred to the NASA astronaut program (see Table 1-4).

Rogers	X-20	I/1962	USAF/Major	Kansas	Killed in an F-105 explosion in September 1967 after leaving X-20 program.
Rushworth	X-15	1958	USAF/(Maj. Gen.)	Maine	Completed the greatest number of X-15 flights—34—and achieved an astronaut rating by flying at an altitude of 285,000 feet. He is now retired from the Air Force.
Taylor	MOL	I/1965	USAF/Lt. Colonel	Arkansas	Killed in a September 1970 T-38 crash after leaving the MOL program.
Thompson	X-20	I/1962	civilian	Minnesota	Completed 14 X-15 flights, reaching a top X-15 1963 altitude of 214,100 feet. He is currently the Associate Director of NASA's Dryden Flight Research Facility.
Truly	MOL	I/1965	USN/(V. Adm.)	Mississippi	Transferred to the NASA astronaut program (see Table 1-4).
Walker	X-15	[1] 1958	civilian	Pennsylvania	Completed 25 X-15 flights, reaching the highest altitude during that program (354,200 feet/108 kilometers), and earning an astronaut rating. Died in June 1966 mid-air collision.
White	X-15	[1] 1958	USAF/(Maj. Gen.)	New York	Completed 16 flights in the X-15, attaining a top altitude of 314,200 feet and achieving the astronaut rating. Now retired from the Air Force.
Wood	X-20	I/1962	USAF/(Colonel)	Arkansas	Now retired from the Air Force.

USAF=United States Air Force; USANG=United States Air National Guard; USN=United States Navy

[1] No specific record of when these three men entered the X-15 program could be found. Examination of the flight record suggests that the dates given here are the most likely years of selection.

TABLE 2-2.—SUMMARY OF U.S. GOVERNMENT ASTRONAUT PROGRAMS

Group/year chosen	Number named	Have flown missions	Died while in program	Resigned	Transferred	Left due to cancellation	Remaining in program
			NASA Astronauts				
I—1959	7	7	1	6	0	0	0
II—1962	9	8	2	6	0	0	1
III—1963	14	10	4	10	0	0	0
IV—1965	6	4	0	6	0	0	0
V—1966	19	17	1	15	0	0	3
VI—1967	11	7	0	8	0	0	3
VII—1969	7	7	0	6	0	0	1
VIII—1978	35	35	5	9	0	0	21
IX—1980	19	17	1	2	0	0	16
X—1984	17	2	0	0	0	0	17
XI—1985	13	0	1	0	0	0	12
XII—1987	15	0	0	0	0	0	15
Subtotal	172	114	15	68	0	0	89
			X-15 Astronauts				
Various	12	8	2	0	[1] 2	8	0
			X-20 Dyna-Soar Astronauts				
I—1962	6	0	0	0	[2] 3	3	0
			Manned Orbiting Laboratory Astronauts				
I—1965	8	0	0	0	[3] 2	6	0
II—1966	5	0	0	0	[1] 5	0	0
III—1967	4	0	1	0	[1] 1	2	0
Subtotal	17	0	1	0	8	8	0
Totals	[4] 207	[5] 121	18	68	13	19	89

[1] To NASA.

[2] Two to the X-15 program; one to the Manned Orbitting Laboratory program.

[3] One to the X-15 program; one to NASA.

[4] Reflects only 194 individuals, 13 of whom were named to more than one program.

[5] 114 people attained astronaut ratings through the NASA space program and 7 through the X-15 program. One person, Engle, achieved astronaut ratings in both the X-15 and NASA programs, but is only counted once in this total.

CHAPTER THREE—PAYLOAD SPECIALISTS AND PASSENGERS ON U.S. MISSIONS

In addition to the professional NASA astronaut corp, non-NASA astronauts are now making spaceflights on U.S. missions. Opportunities for space flight aboard the space shuttle were available in two categories, payload specialists and passengers, but following the 1986 *Challenger* tragedy, the passenger (or "space flight participant") program was suspended indefinitely.

Payload specialists are individuals with specific expertise who are selected for their knowledge, experience and familiarity with a specific payload. They receive 160 hours of training (at the user's expense) before the flight, reporting to Johnson Space Center no more than six months and no less than three months prior to the flight. Payload specialists can come from NASA itself (outside the astronaut corps), other government agencies, industry or academia.

For several years, the Department of Defense (DOD) had its own pool of payload specialists, called Manned Spaceflight Engineers, to fly on dedicated DOD shuttle missions. Following the *Challenger* tragedy and the subsequent decline in planned DOD use of the shuttle (in favor of using expendable launch vehicles), the MSE program was terminated. Only two MSEs—Gary Payton (STS 51-C) and William Pailes (STS 51-J)— have actually flown missions. Five more are assigned to missions as primary or backup payload specialists and will continue in training. Four are either prime or backup payload specialists for STS-42, the Starlab mission for the Strategic Defense Initiative Organization: Captain Maureen LaComb (prime); Major Craig Puz (prime); Kenneth P. Bechis (backup); and Dennis L. Boeson (backup). The fifth DOD payload specialist is Major Robert Crombie, who is training as a backup to NASA astronauts for STS-39 (IBSS/Cirris). The Air Force will not release information about these individuals, so they are not listed in the biographical section of this chapter, although they are included in Table 3-1.

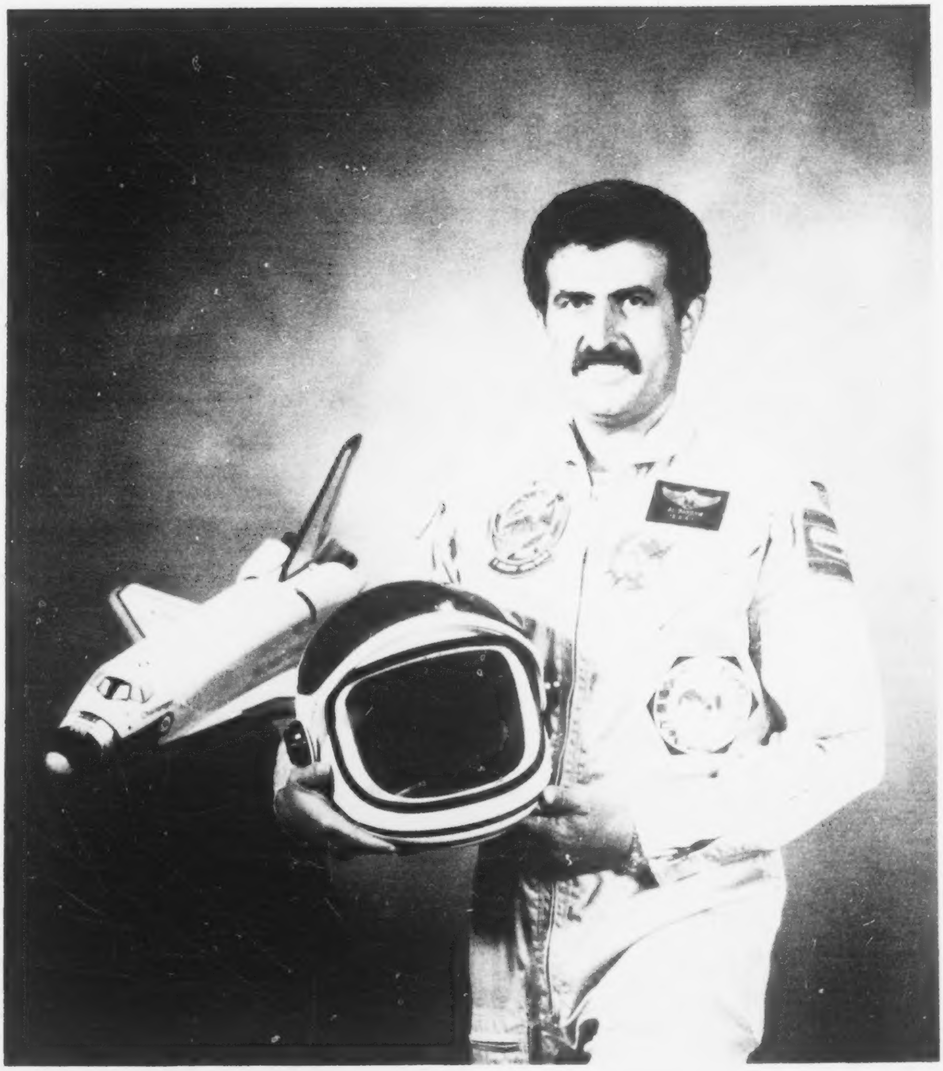
NASA has also carried individuals on the shuttle simply as passengers, with no connection to a particular payload (although they did perform some experiments for NASA). Senator Jake Garn was the first passenger, serving as a congressional observer on STS 51-D in April 1985; Congressman Bill Nelson flew in January 1986. After the *Challenger* tragedy, in which a payload specialist (Gregory Jarvis) and a passenger ("Teacher in Space" Christa McAuliffe) were killed, NASA revised its policies on payload specialists and passengers, limiting the number of non-NASA astronauts that would be allowed to fly on future missions. Payload specialists will continue to be selected as needed, but the selection and flight assignment of passengers has been suspended.

This chapter contains biographies and statistical information on those payload specialists (U.S. and foreign) and passengers who have already flown missions, were backups, or are presently scheduled for a future flight. Thus, individuals like Claude Nicollier, who is an astronaut for the European Space Agency, but has not yet flown in space and is not scheduled for a mission, are excluded. Some biographies in this section are not complete because information is not available.

BIOGRAPHIES OF PAYLOAD SPECIALISTS AND PASSENGERS ON U.S. MISSIONS

Loren Wilbur Acton; civilian; born March 7, 1936, Lewiston, Montana; married, two children. **Spaceflight: STS 51-F**

Received bachelor of science from Montana State University (1959) and a doctorate from the University of California (1965). He was the senior staff scientist with the Space Sciences Laboratory, Lockheed Palo Alto Research Laboratory, specializing in studies of the Sun and other celestial objects when chosen as one of two payload specialists for the Spacelab 2 mission. Acton flew on STS 51-F in August 1985.



Abdulmohsen Hamad Al-Bassam; Saudi Arabia; Major, Saudi Royal Air Force; born December 12, 1948, Onaisah, Saudi Arabia; married, two children.

Received bachelor of air science from King Faisal Air Academy in Riyadh; attended Pilot Instructor School, Instrument Pilot Instructor School, Instructor Training School at Randolph AFB, Texas; and Weapons and Tactics Instructor School, Williams AFB, Arizona. He was selected as backup payload specialist by the Arab Satellite Communication Organization for the launch of Arabsat 2. The satellite was launched on STS 51-G in 1985.

SULTAN SALMAN
AL-SAUD

Sultan Salman Al-Saud; Saudi Arabia; civilian; born June 27, 1956, Riyadh, Saudi Arabia; single. **Spaceflight: STS 51-G**

Received bachelor of arts degree in mass communications, University of Denver. He is currently acting director, Saudi Arabian Television Commercial Department. Al-Saud is an experienced pilot with a commercial pilot's license. He was a payload specialist on STS 51-G, which launched Arabsat 2 for the Arab Satellite Communication Organization.

John-David Bartoe; civilian; born November 17, 1944, Abingdon, Pennsylvania; married, three children (by a previous marriage).
Spaceflight: STS 51-F

Received bachelor of science from Lehigh University (1966), master of science from Georgetown University (1974), and a doctorate from Georgetown (1976). He was a supervisory astrophysicist with the Naval Research Laboratory in Washington, D.C. and flew on STS 51-F (Spacelab 2) in August 1985. He is currently Chief Scientist for NASA's Space Station program.

CNES
PATRICK
FRA
NASA
NASA

Patrick Baudry; France; Major, French Air Force; born March 6, 1956, Douala, United Republic of the Cameroon; married, one child. **Spaceflight: STS 51-G**

Received master of aeronautical engineering (1969) and fighter pilot's certificate (1970) from the French Air Force Academy. He later completed the British test pilot course. Baudry was selected as a CNES astronaut in 1980, and trained at CNES (the French space agency) and at Star City, near Moscow as a backup crew member for the Soyuz T-6 mission. He then was chosen as the primary French crew member to fly on a U.S. shuttle mission and flew on STS 51-G. He is now working on CNES studies for the Hermes spacecraft.

Roberta Lynn Bondar; Canada; civilian; born December 4, 1945 in Sault Ste. Marie, Ontario; single.

Received a bachelor of science in zoology and agriculture from the University of Guelph (1968), master of science in experimental pathology from the University of Western Ontario (1971), a doctorate in neurobiology from the University of Toronto (1974) and a doctor of medicine from McMaster University (1977). She is a practicing neurologist and clinical researcher. Prior to being chosen as a Canadian astronaut in 1983, she was an assistant professor of neurology at McMaster University. She is currently training for STS-45 (IML-1) awaiting final selection of a crew.

MIKE BOOEN
NASA

Michael W. Booen; Major, USAF; born October 30, 1957, Malmstrom Air Force Base, Montana.

Received bachelor of science in engineering mechanics from the U.S. Air Force Academy (1979) and master of science in engineering from Stanford University (1982). Booen was a research engineer at the Air Force Weapons Laboratory, and was the backup payload specialist for STS 51-J.

Renate Luise Brummer; Germany; civilian; born May 4, 1955 in St. Gallen, Switzerland; single.

Received degree in math and physics (1981) from the University of Munich and a doctorate in meteorology (1986) from the University of Miami. She was a research associate at the University of Colorado at the time of her selection as a German astronaut in 1987. She is one of five German astronauts training for the upcoming STS-52 (Spacelab D-2) mission; two will be chosen at a later date to fly.

BILL
NASA
HUGHES

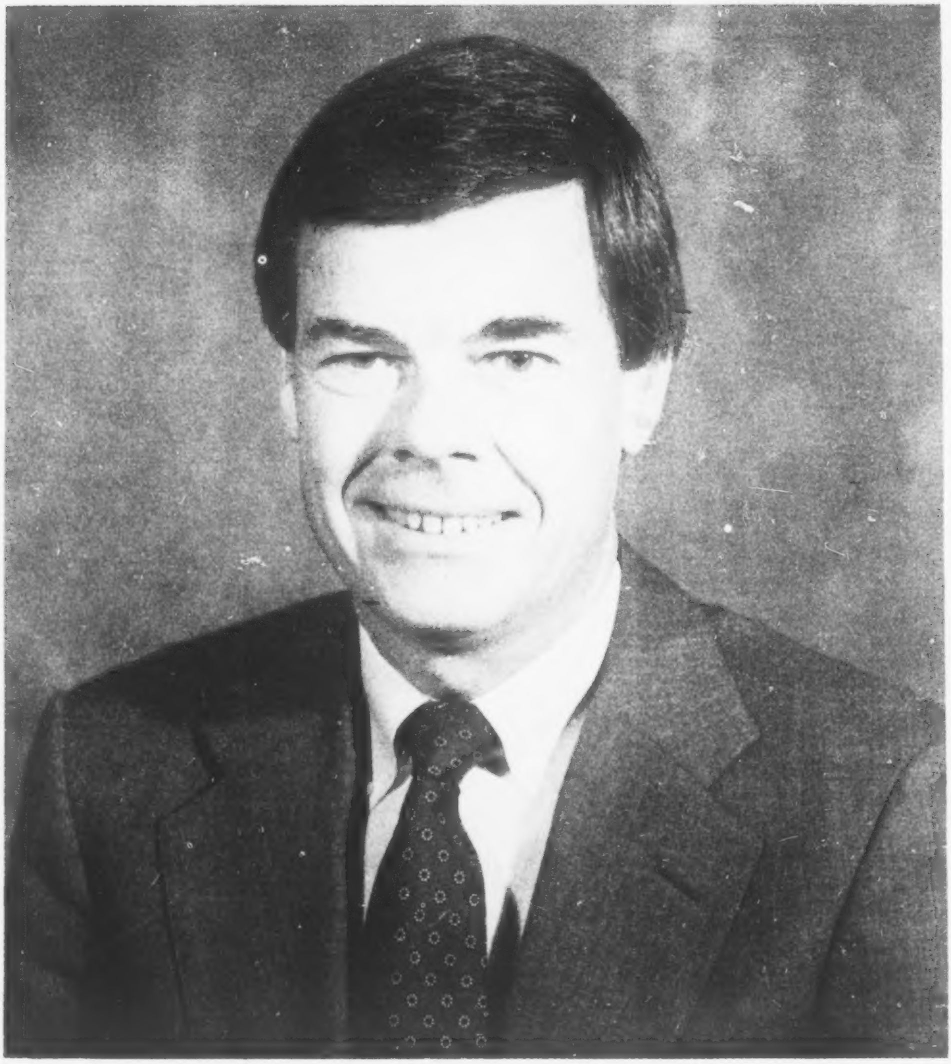
L. William Butterworth; civilian; born July 17, 1948, Casper, Wyoming; married.

Received bachelor of science in engineering (1970) and a master of science in mechanical engineering (1971) from the California Institute of Technology. He has worked at the Jet Propulsion Laboratory and Hughes Aircraft Company. In 1974, he joined the staff of NASA's Pioneer Venus Program, and, following its successful completion, joined the Galileo Probe Program. Currently, he is the Assistant Program Manager for the Galileo Probe. Mr. Butterworth was selected as a payload specialist in July 1984 and was the backup for the STS 51-L mission.

BOB CENKER
NASA
SATCOM
K-Band
RCA
SA

Robert Joseph Cenker; civilian; born November 5, 1948, Uniontown Pennsylvania; married, three children. **Spaceflight: STS 61-C**

Received bachelor of science (1970) and master of science (1973) in aerospace engineering from Penn State University, and a master of science in electrical engineering from Rutgers University (1977). Cenker has worked at RCA Astro-Electronics (now General Electric) since 1972, primarily on the design and development of Satcoms 1 and 2. He was a payload specialist on STS 61-C which launched RCA's Satcom satellite.



Charles R. Chappell; civilian; born June 2, 1943, Greenville, South Carolina.

Received bachelor of arts in physics from Vanderbilt University (1965) and a doctorate in space science from Rice University (1968). Chappell was a research and staff scientist for Lockheed Missiles and Space Company where he studied the Earth's ionosphere and magnetosphere. He has been at the Marshall Space Flight Center since 1974, where he is now Associate Director for Science. He was the mission scientist for STS-9 (Spacelab-1), and is an alternate payload specialist for the Atlas-1 mission (STS-47).

J.L. CHRETIEN
Ж.Л. КРЕТЬЕН
САЛЮТ
cnes
FRANCE

Jean-Loup Chretien

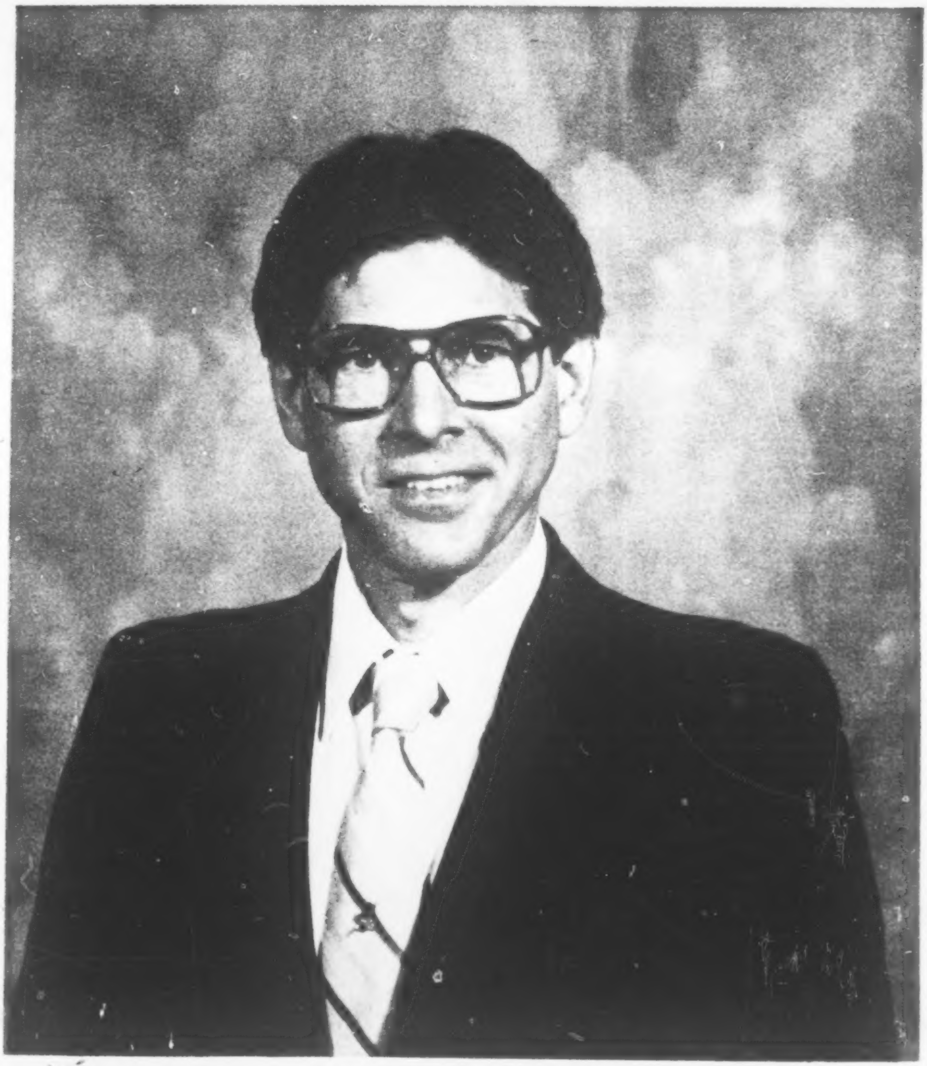
Biography under Foreign Cosmonaut-Researchers on Soviet Missions (chapter 5). Chretien was Baudry's backup for STS 51-G, but his two spaceflights were made on Soviet missions (in 1982 and 1988).

Roger Crouch; civilian; born September 12, 1940, Jamestown, Tennessee; divorced, three children.

Received bachelor of science in physics from Tennessee Tech (1962), master of science (1968) and doctorate (1971) in physics from Virginia Tech. Crouch has been Chief Scientist for the Microgravity Science and Applications Division of the Office of Space Science and Applications at NASA Headquarters since 1985, prior to which he worked at NASA's Langley Research Center specializing in materials science research. He is a payload specialist candidate for STS-45 (IML-1), awaiting final selection of a crew.

Takao Doi; Japan; civilian; born September 18, 1955, Tokyo; married.

Received doctorate in aeronautical engineering from the University of Tokyo (1983) and then worked as a research associate for Japan's Institute of Space and Astronautical Science (ISAS). Subsequently, he was a National Research Council research associate at NASA's Lewis Research Center. He was chosen by the Japanese space agency (NASDA) as a payload specialist in 1985. He is currently training at Colorado University for the Japanese Spacelab (Spacelab–J) mission on STS–48.



Samuel T. Durrance; civilian; born September 17, 1943, Tallahassee, Florida; married, one child.

Received bachelor of science (1972) and master of science (1974) in physics from California State University (Los Angeles) and a doctorate in astro-geophysics from the University of Colorado (1980). He is an associate research scientist in the Department of Physics and Astronomy at Johns Hopkins University and assistant project scientist for the Hopkins Ultraviolet Telescope. Dr. Durrance has participated in the design, construction, calibration, integration, and launch of telescope/UV spectrometer payloads to study the origin and evolution of the solar system and other planetary systems and the origin of life in the universe. Dr. Durrance is a payload specialist in training to operate astronomy experiments as part of the STS-35 (Astro-1) mission.

Reinhard Furrer; Germany; civilian; born November 25, 1940, Worgl, Federal Republic of Germany. **Spaceflight: STS 61-A**

Received diploma and doctorate in physics from the Universities of Kiel and Berlin, and was a visiting scientist at the University of Chicago and Argonne National Lab. In 1983, he was selected as a payload specialist for the German Spacelab mission, Spacelab D-1 (STS 61-A).

Andrew Gaffney; civilian; born June 9, 1949, Carlsbad, New Mexico; married, two children.

Received bachelor of arts degree, University of California, Berkeley (1968); and doctor of medicine, University of New Mexico (1972). He is an associate professor of medicine and cardiology at the University of Texas Health Science Center, Southwestern Medical School, in Dallas, Texas, and Director of Echocardiography for Parkland Memorial Hospital. Dr. Gaffney is assigned as a payload specialist aboard STS-40 (SLS-1), the first Spacelab mission dedicated to life sciences, scheduled for launch in mid-1990.

NASA
JAKE GARN
NASA
USA

Jake Garn; civilian; born October 12, 1932, Richfield, Utah; married, seven children (four by a previous marriage). **Spaceflight:** – **STS 51-D**

Received bachelor of science degree in business and finance, University of Utah. He was formerly an insurance executive and Navy pilot. He was elected to the U.S. Senate in 1974 and reelected in 1980 and 1986. Garn was the first passenger on the space shuttle, flying on STS 51-D as a congressional observer.

Mark Garneau; Canada; Captain, Canadian Navy (Retired); born February 23, 1949 in Quebec City, Quebec; married, two children.
Spaceflight: STS 41-G

Received bachelor of engineering physics from the Royal Military College of Kingston (1970) and a doctorate in electrical engineering from the Imperial College of Science and Technology, London (1973). Garneau served a number of posts in the Canadian Navy prior to his selection as a Canadian astronaut in 1983. He flew as a payload specialist on STS 41-G and was the first Canadian in space. In early 1989, he retired from the Canadian Navy and was named deputy program manager of the Canadian astronaut program.

Millie Hughes-Fulford; civilian; born December 21, 1945, Mineral Wells, Texas; married, one child.

Received bachelor of science in chemistry and biology, Tarleton State University (1968), and a doctorate in chemistry, Texas Women's University (1972). Since 1973, she has been at the V.A. Medical Center in San Francisco and is an associate professor of biochemistry at the University of California Medical Center in San Francisco. Dr. Hughes-Fulford is in training for STS–40 (SLS–1) the first Spacelab mission dedicated to life sciences.

ISA
GREG
NASA
HUGHES

Gregory Bruce Jarvis; civilian; born August 24, 1944, Detroit, Michigan; died January 28, 1986 in the *Challenger* explosion; was married, three children.

Received bachelor of science in electrical engineering from the State University of New York at Buffalo and a master of science degree in electrical engineering from Northeastern University. He worked at Raytheon on missiles and, later, satellite communications programs. In 1973, Mr. Jarvis joined Hughes Aircraft Company's Space and Communications group, working on the Marisat and Leasat programs. He was selected as a payload specialist candidate in July 1984 and was assigned to STS 51-L (*Challenger*), which exploded shortly after launch.

Mary Helen Johnston; civilian.

Received doctorate in metallurgical engineering from the University of Florida and worked at NASA's Marshall Space Flight Center in the Materials and Processes Laboratory. Dr. Johnston was a backup payload specialist for Spacelab 3, which flew on STS 51-B.

O NOT CLIMB
ON DISPLAY

Michael L. Lampton; civilian; born March 1, 1941, Williamsport, Pennsylvania; married, one child.

Received bachelor of science in physics from the California Institute of Technology (1962) and a doctorate from the University of California at Berkeley (1967). He is a research physicist at the Space Sciences Laboratory at the University of California at Berkeley, specializing in X-ray and UV astronomy, space physics, and optical and electronic engineering. Dr. Lampton was a backup on the STS-9 (Spacelab 1) mission, and is now training to serve as a payload specialist for the Atlas-1 mission (STS-47).

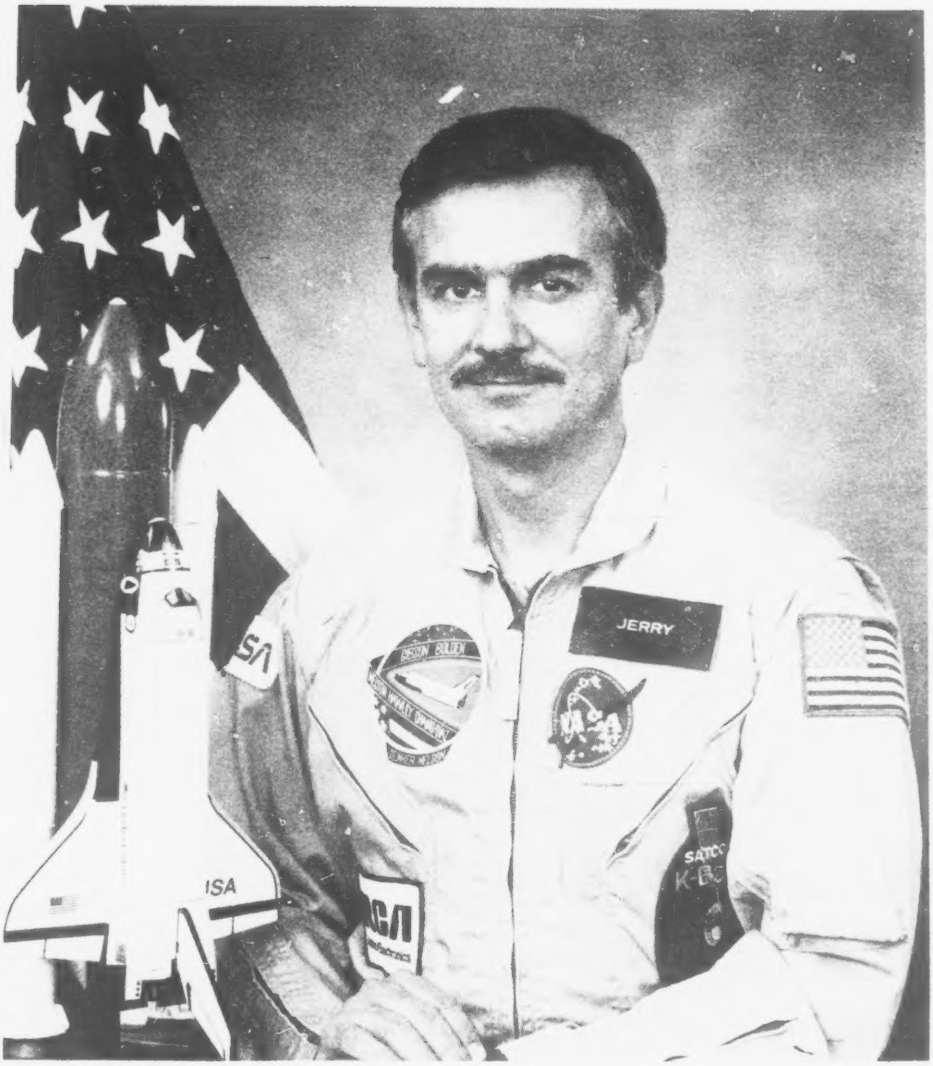
Byron Kurt Lichtenberg; civilian; born February 19, 1948, Stroudsberg, Pennsylvania; married, two children. **Spaceflight: STS-9**

Received bachelor of science in electrical engineering from Brown University (1969); master of science in mechanical engineering (1975); and doctorate in biomedical engineering (1979) from MIT. Served as a captain in the U.S. Air Force from 1969–1973, including a tour of duty in Vietnam, and is currently a major in the Massachusetts Air National Guard. He is president of Payload Systems, Inc., an engineering consulting firm. Dr. Lichtenberg flew as one of the first two payload specialists on STS-9 (Spacelab 1), and has been selected to fly on the shuttle with Atlas-1 (STS-47).

S. MACLEAN
CANADIAN ASTRONAUT PROGRAM

Steven Glenwood MacLean; Canada; civilian; born December 14, 1954, Ottawa, Ontario, Canada; single.

Received bachelor of science in honors physics (1977) and doctorate in astrophysics (1983) from York University. Dr. MacLean was a visiting scholar at Stanford University working on electro-optics, laser induced fluorescence of particles and crystals and multiphoton laser spectroscopy. He was one of six Canadian astronauts selected in December 1983, and is currently training to serve as a payload specialist on the STS-53 (CANEX-2) mission.



Gerard E. Magilton; civilian; born May 7, 1942, Philadelphia, Pennsylvania; married, four children.

Received bachelor of science in electrical engineering from Drexel University (1965). Magilton has worked at Philco Ford Defense Electronics and RCA Astro-Electronics (now part of General Electric). He is currently Manager of Integration and Testing for Spacenet and GStar satellites at GE. He was the backup payload specialist for the RCA Satcom mission (STS 61-C).

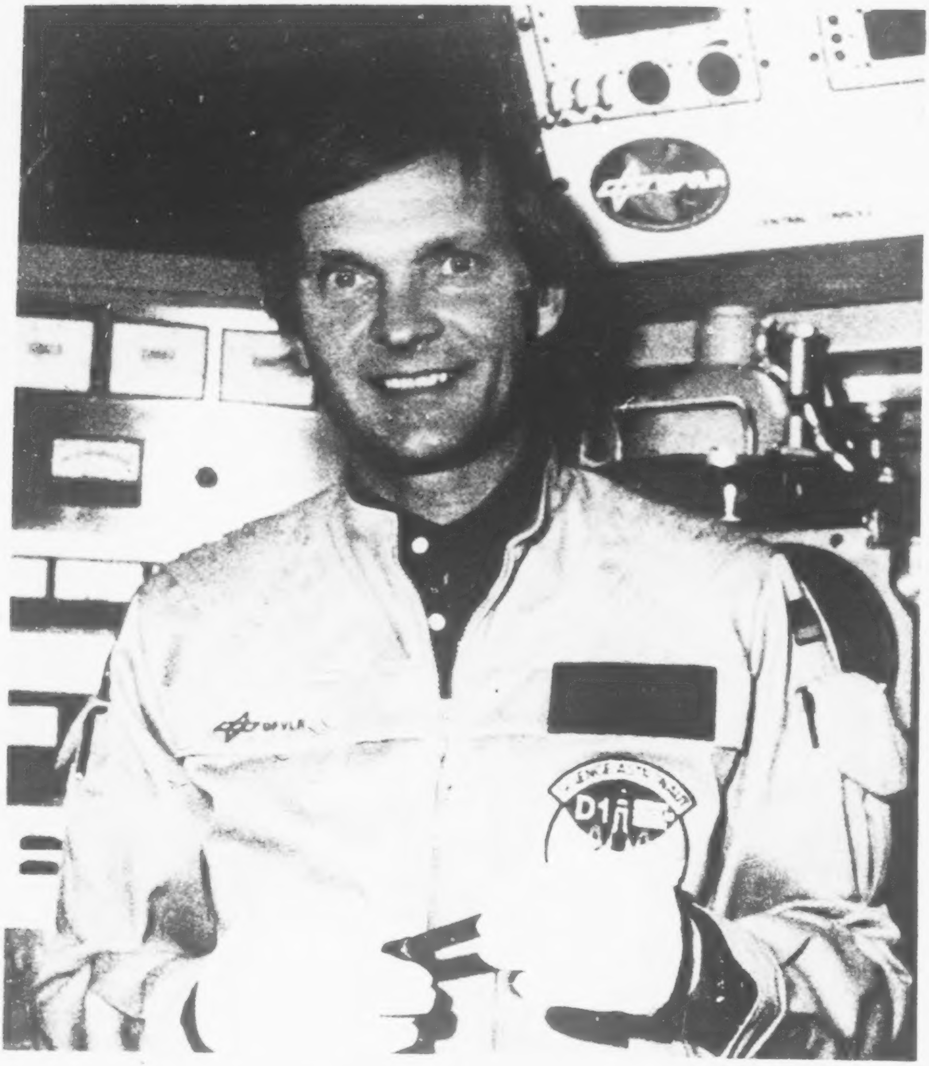
NASA
CHRISTA
NASA

Sharon Christa Corrigan McAuliffe; civilian; born September 2, 1948, Boston, Massachusetts; died January 28, 1986 in the *Challenger* explosion; was married, two children.

Received bachelor of arts in education from Framingham State College (1970) and master of arts in education from Bowie State College (1978). McAuliffe taught junior high school English and American history in Maryland and high school economics, law, and American history in New Hampshire. She was selected as the primary candidate for NASA's Teacher in Space Project and flew on STS 51-L (*Challenger*), which exploded shortly after launch.

Ulf Merbold; Germany; civilian; born 1941, Greiz, Germany; married, two children. **Spaceflight: STS-9**

Received doctorate in science (1976), Stuttgart University. He worked as a solid-state physicist at the Max-Planck Institute for Metals Research. He was one of three payload specialists selected by the European Space Agency, and flew on STS-9 (Spacelab 1), the first Spacelab flight. He was the first non-American to fly on a U.S mission. He is currently in training for the STS-45 (IML-1) mission, awaiting final selection of a crew.



Ernst Messerschmid: Germany; civilian; born May 21, 1945, Reutlingen, Federal Republic of Germany; married. **Spaceflight: STS 61-A**

Received diploma in physics (1972) and doctorate in physics (1976), studying at the Universities of Tubingen and Bonn. He was a visiting scientist and fellow at CERN, Geneva, and a lecturer and research associate at Freiberg University and Brookhaven National Laboratory, New York. From 1978 to 1982, he worked at the Institute of Communication Technology, DFVLR, at Oberpfaffenhofen, conducting research in space communications. He was a member of the crew for the STS 61-A mission (Spacelab D-1).

Mamori Mohri; Japan; civilian; born January 29, 1948, Hokkaido, Japan; married, three children.

Received bachelor of science (1970) and master of science (1972) in chemistry from Hokkaido University, Japan and a doctorate in chemistry from Flinders University, Australia (1976). Dr. Mohri taught at Hokkaido University in the Department of Nuclear Engineering and was an Associate Professor there when he was selected as a NASDA payload specialist in 1985. In addition to training for the STS-48 (Spacelab-J) mission, he is currently an adjunct professor of physics at the University of Alabama at Huntsville.

K. MONEY
Canada
CANADIAN ASTRONAUT PROGRAM

Kenneth Money; Canada; civilian; born January 4, 1935 in Toronto, Ontario; married, one child.

Received bachelor of science in physiology and biochemistry (1958), master of science (1959) and a doctorate (1961) in physiology from the University of Toronto. He has also graduated from the Royal Canadian Air Force flight school (1957) and the National Defense College (1972). Money was a senior scientist for the Department of National Defense prior to joining the Canadian astronaut program. He is now training to participate in the STS-45 (IML-1) Spacelab mission, awaiting final selection of a crew.

Barbara Radding-Morgan; civilian; born November 28, 1951, Fresno, California; married, two children.

Received bachelor of arts in human biology from Stanford University (1973). She has taught school at Flathead Indian Reservation in Montana, as well as in Quito, Ecuador, and McCall, Idaho. She was the backup "Teacher in Space" for STS 51-L, and has resumed teaching in McCall, Idaho in 1986. She also continues to work as a Teacher Ambassador for NASA.

Chaiki Naito-Mukai; Japan; civilian; born May 6, 1952, Tokyo, Japan; married.

Received doctorate of medicine from Department of Cardiovascular Surgery, Keio University, Tokyo. Dr. Mukai did her residency in general surgery at Keio University Hospital in Tokyo, and was an instructor at the Department of Cardiovascular Surgery when she was chosen as a NASDA payload specialist in 1985. She is now training for STS-48 (Spacelab-J) at NASA's Johnson Space Center.

Bill Nelson; civilian; born September 29, 1942, Miami, Florida; married, two children. **Spaceflight: STS 61-C**

Received bachelor of arts in political science from Yale University (1965) and a juris doctorate in law from University of Virginia (1968). Nelson was also a Captain in the U.S. Army. He was elected to the Florida Legislature in 1972, served six years and was then elected to the U.S. Congress in 1978. He was reelected to his sixth term in 1988. Nelson flew as a space flight passenger on STS 61-C.

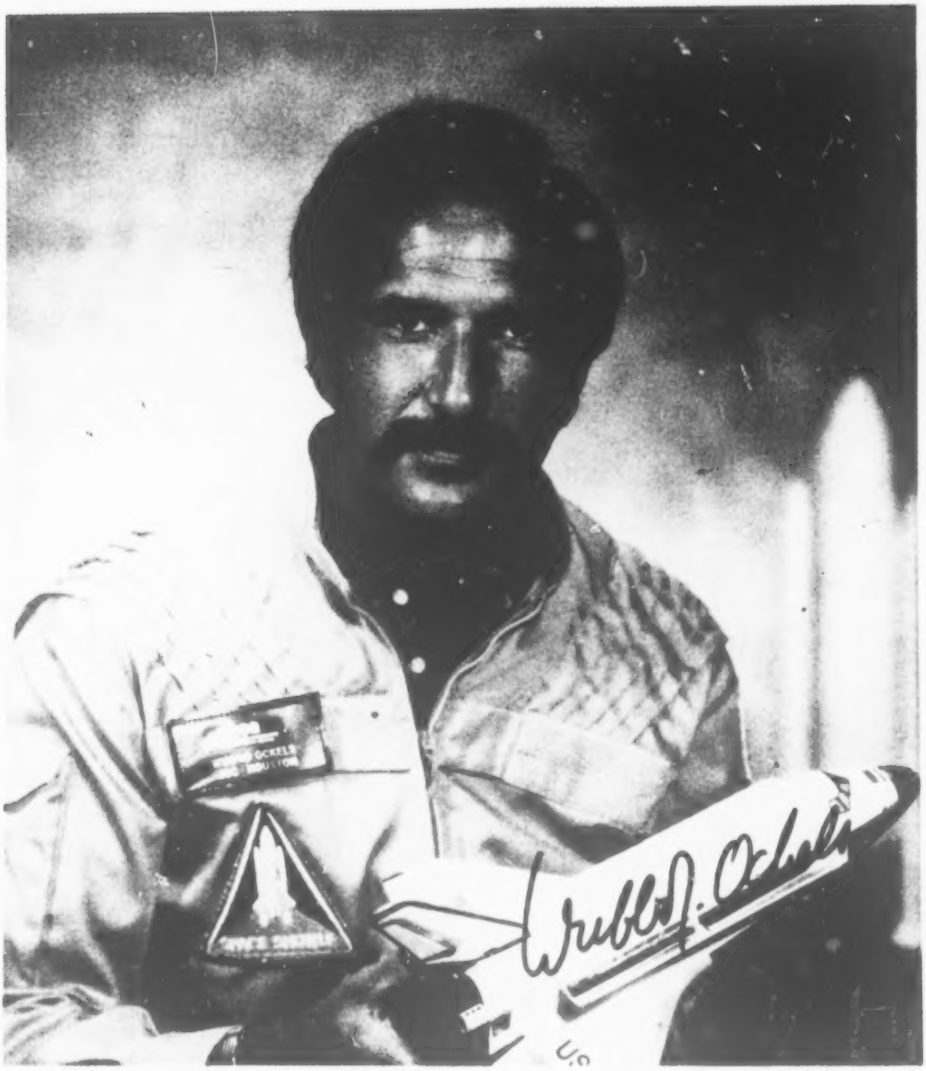
USA
RODOLFO NERI
NASA
MEXI

Rodolfo Neri Vela; Mexico; civilian; born February 19, 1952, Chilpancingo, Mexico. **Spaceflight: STS 61-B**

Received bachelor of arts in mechanical and electronic engineering, University of Mexico (1975), studied in the masters program in telecommunications systems at the University of Essex (1975-76) and earned a doctorate in electro-magnetic radiation from the University of Birmingham, England. Neri has worked at the Institute of Electrical Research and was head of the Department of Planning and Engineering of the Morelos Satellite Program at the Ministry of Communications and Transportation. He was payload specialist on STS 61-B, when Morelos was launched. He is now at the National University of Mexico.

Kenneth H. Nordsieck; civilian; born February 19, 1946, Santa Barbara, California; single.

Received bachelor of science in astronomy, California Institute of Technology (1967), and doctorate, University of California (1972). He is an associate professor at Washburn Observatory, University of Wisconsin. He is a co-investigator for the Wisconsin Ultraviolet Photopolarimetry Experiment, one of the experiments aboard STS-35 (Astro-1), a Spacelab astronomy mission.



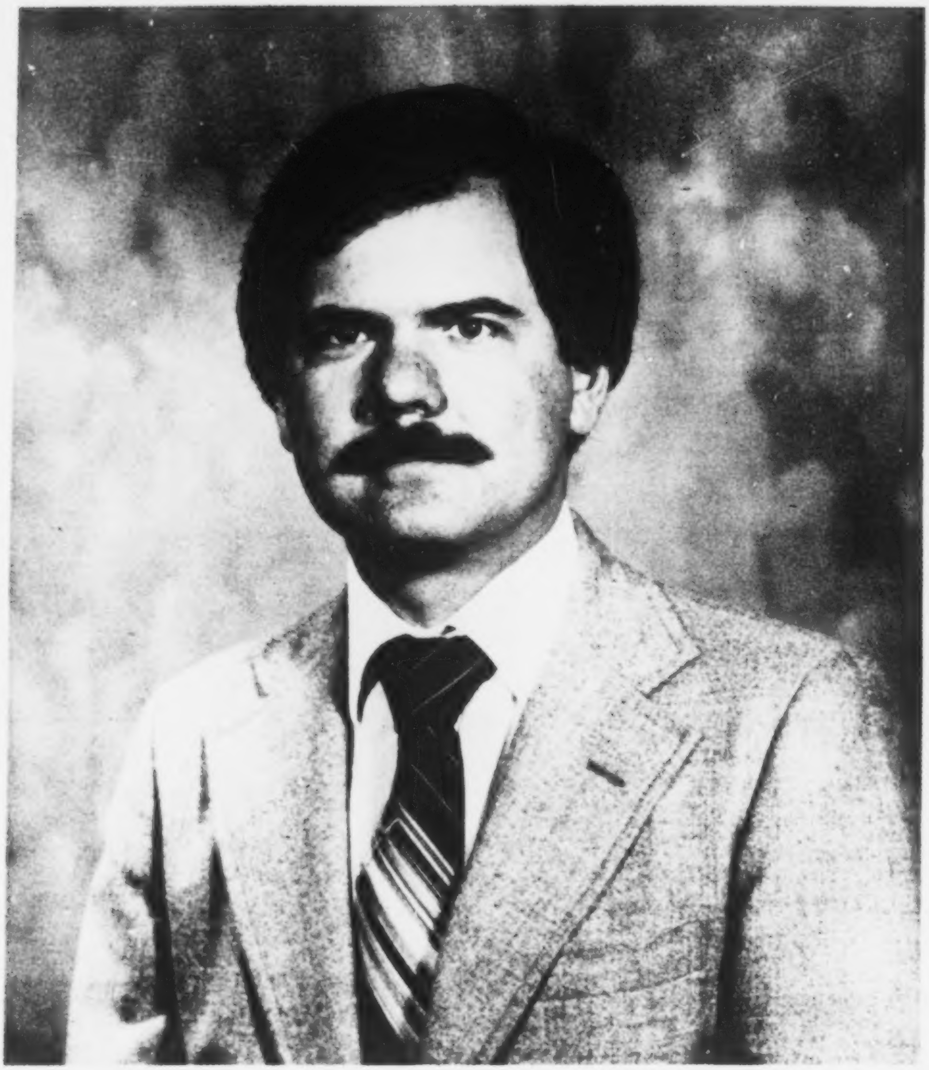
Wubbo J. Ockels; civilian; born March 28, 1946, Almelo, the Netherlands; married, two children. **Spaceflight: STS 61-A**

Received doctorate in physics and mathematics from University of Groningen (1973). He worked at the Nuclear Physics Accelerator Institute in Groningen until his selection in 1978 by the European Space Agency as one of three payload specialists. He was a back-up for the Spacelab-1 flight and flew on STS 61-A as a payload specialist on the Spacelab D-1 mission.

BILL PAILES

William Pailes; Major, USAF; born June 26, 1952, **Hackensack,** New Jersey. **Spaceflight: STS 51-J**

Received bachelor of science in computer science from the U.S. Air Force Academy and master of science in computer science from Texas A&M University (1981). He attended pilot training at Williams Air Force Base and Squadron Officer School. He flew as a payload specialist on STS 51-J, a classified Department of Defense mission.



Ronald A. Parise; civilian; born May 24, 1951, Warren, Ohio; married, one child.

Received bachelor of science in physics, Youngstown State University (1973); master of science (1977) and doctorate (1979) in astronomy, University of Florida. He is manager of the Advanced Astronomy Programs Section, Computer Sciences Corporation, in Silver Spring, Maryland. He is a member of the research team for the Ultraviolet Imaging Telescope, and is scheduled to fly on STS–35 (Astro–1), a series of Spacelab astronomy experiments.

Gary E. Payton; Major, USAF; born Rock Island, Illinois. **Spaceflight:** STS 51-C

Major Payton flew on STS 51-C, as the first military payload specialist.

MEXICO
RICARDO
PERALTA
FABI
NASA
USA

Ricardo Peralta y Fabi; Mexico; civilian; born August 15, 1950, Mexico.

Received bachelor of science in aerospace engineering, University of Illinois (1973), master of science in mechanical engineering from McGill University (1975), and a doctorate in mechanical engineering. He was also a postdoctoral fellow in aerospace medicine. Peralta was a research professor and Head of the Micromechanics Laboratory at the Institute of Engineering at the National University of Mexico. He was the backup payload specialist for STS 61-B.

Dianne Kasnic Prinz; civilian; born September 29, 1938, Economy, Pennsylvania; married.

Received bachelor of science from the University of Pittsburgh (1960) and a doctorate from Johns Hopkins University (1967). She is a research physicist with the Naval Research Laboratory in Washington, D.C., specializing in solar-terrestrial relationships and the design of optical instrumentation. She was an alternate payload specialist for Spacelab 2, and worked during the mission as a troubleshooter in the Payload Operations Control Center.

Hans Wilhelm Schlegal; Germany; Lieutenant Colonel, German Army Reserve; born August 3, 1951, Überlingen; married, three children.

Received a diploma in physics from the University of Aachen (1979). After completing his degree, he was a scientist at the university. Prior to being selected as a German astronaut in 1987, Schlegal was a specialist in materials testing methodology at Institute Dr. Forster GmbH & Co. KG. He is now training for STS–52, the second German Spacelab mission (D–2), awaiting final selection of the crew.

Paul Desmond Scully-Power; civilian; born May 28, 1944, Sydney, Australia (became a U.S. citizen in 1982); married, six children.
Spaceflight: STS 41-G

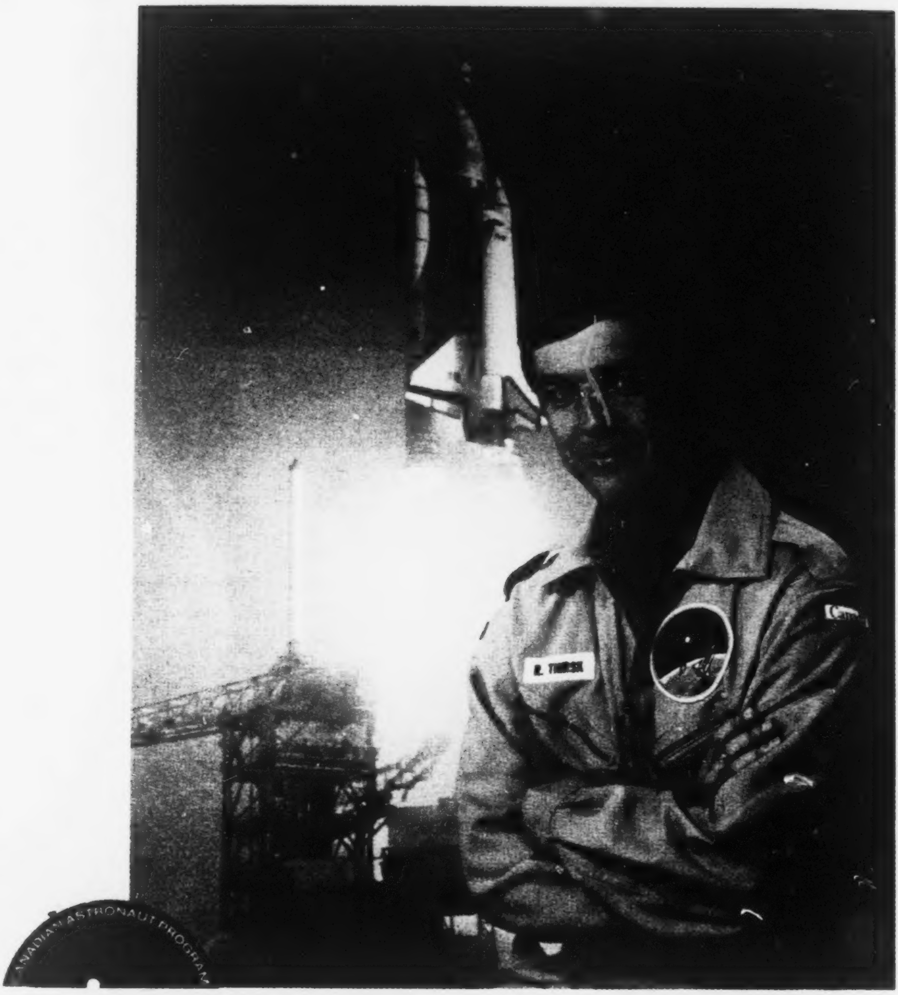
Bachelor of science, post graduate diploma of education, University of Sydney (1966). Established and served as head of first oceanographic group of Royal Australian Navy, 1967-1972. While an exchange scientist with the U.S. Navy, he was invited to assist the Earth Observations Team on Skylab, and has worked in space oceanography for each piloted spacecraft mission since then. Scully-Power served as principle foreign investigator for the Heat Capacity Mapping Mission. Since emigrating to the United States, he has served as a senior scientist and technical specialist at the Naval Underwater Systems Center. He was a payload specialist on STS 41-G.

George W. Simon; civilian; born April 22, 1934, Frankfurt, Germany; married, three children.

Received bachelor of arts from Grinnell College (1955); master of science (1961) and doctorate (1963) from the California Institute of Technology; and a master of business administration from the University of Utah (1976). He is senior scientist at the Space Physics Division, Air Force Geophysics Laboratory, National Solar Observatory. Dr. Simon was an alternate payload specialist for STS 51-F (Spacelab 2), and assisted in the Payload Operations Control Center during the flight.

Gerhard Thiele; Germany; civilian; born September 2, 1953 in Heidenheim on Brenz; married, three children.

Received a diploma in physics from the Max Planck Institute for Astronomy in Heidelberg/Konigsstuhl (1980), and a doctorate at the Institute for Environmental Physics of Heidelberg University (1985). At the time of his selection as an astronaut in 1987, he was a visiting scientist at the Program in Atmospheric and Ocean Sciences at Princeton University. He is one of five German astronauts in training for STS-52, the next German Spacelab mission (D-2); two will later be chosen to fly.

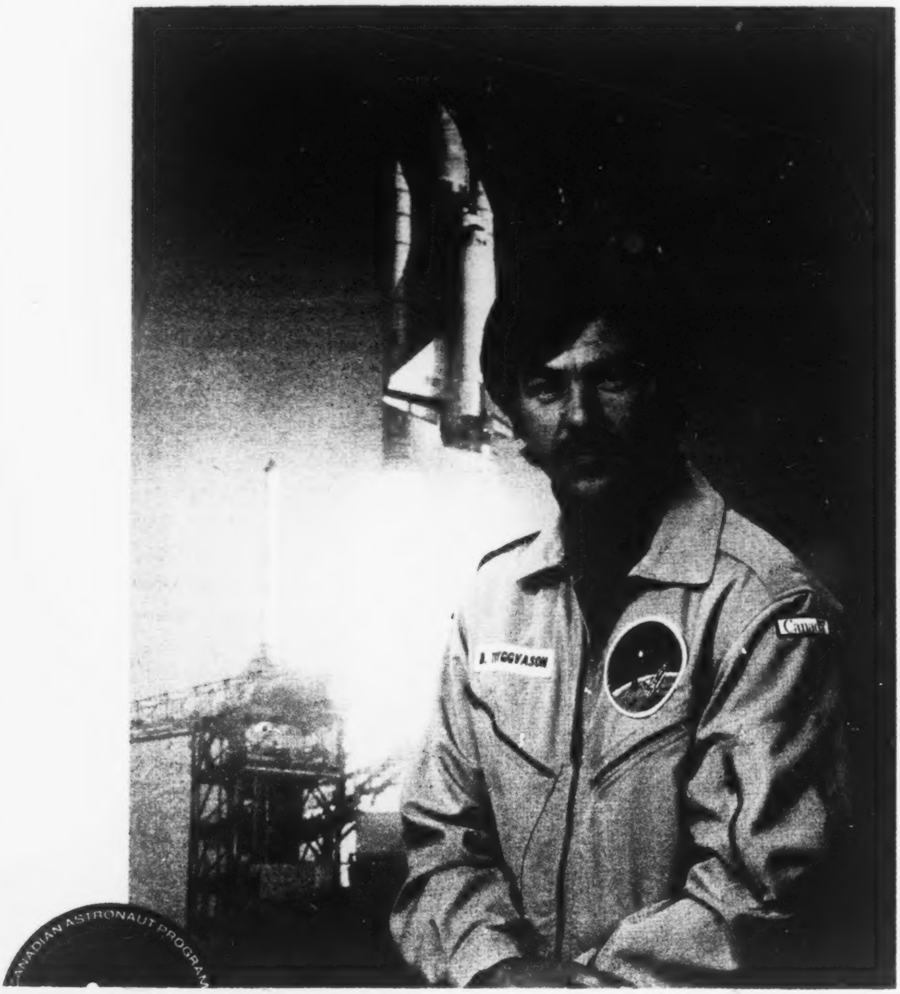


Robert Brent Thirsk; Canada; civilian; born August 17, 1953 in New Westminster, British Columbia; married, one child.

Received bachelor of science degree in mechanical engineering from the University of Calgary (1976), master of science in mechanical engineering from the Massachusetts Institute of Technology (1978), and a doctor of medicine from McGill University (1982). Thirsk was in the family medicine residency program at Queen Elizabeth Hospital in Montreal when selected to begin astronaut training in 1983. He was a back-up payload specialist for STS 41-G. Thirsk currently has a part-time medical practice in Ottawa and is continuing his work with the Canadian astronaut program.

Eugene H. Trinh; civilian; born September 1, 1950; Saigon, South Vietnam; married.

Received bachelor of science in engineering science, Columbia University (1972), master of science (1974), master of philosophy (1976), and doctorate in applied physics (1978) from Yale University. He joined NASA's Jet Propulsion Laboratory in 1979, where he is currently a physicist, specializing in fluid mechanics, using acoustic levitation apparatus in his research on free drops in normal gravity and zero gravity. Dr. Trinh was a backup for Spacelab 3 which flew on STS 51-B in 1985.



Bjarni B. Tryggvason; Canada; civilian; born September 21, 1945 in Reykjavik, Iceland; married, two children.

Received a bachelor of applied science in engineering physics from the University of British Columbia (1972) and did postgraduate work in engineering and applied mathematics at the University of Western Ontario. Tryggvason has worked as a meteorologist, mathematician, flight instructor and university lecturer. He was selected as one of six Canadian astronauts in 1983, and is now training as the back-up payload specialist for the CANEX–2 mission.

Lodewijk van den Berg; civilian; born, Sluiskil, Netherlands. **Spaceflight: STS 51-B**

Received doctorate in applied science from the University of Delaware and was a chemical engineer at EG&G Energy Measurements Inc., Goleta, California. He flew on STS 51-B (Spacelab 3) as a payload specialist.

NASA
CHARLIE WALKER
EOS

Charles David Walker; civilian; born August 29, 1948, Bedford, Indiana; unmarried. **Spaceflights: STS 41-D, 51-D, and 61-B**

Received bachelor of science in aeronautical and astronautical engineering, Purdue University in 1971. He worked as a design engineer at Bendix Aerospace Company and as a project engineer at Naval Sea Systems Command Engineering Center. Walker joined McDonnell Douglas in 1977 as a test engineer, and later became Chief Test Engineer and Payload Specialist for the Electrophoresis Operations in Space program. In that capacity, he made three shuttle flights: STS 41-D (1984), 51-D (1985) and 61-B (1985). He is currently Special Assistant to the President of McDonnell Douglas Space Systems Company for Space Programs Development, and is also President of the National Space Society, and Chairman of the Board of SpaceCause.

Heike Walpot; Germany; civilian; born June 19, 1960 in Düsseldorf, Federal Republic of Germany; married, one child.

Received doctorate of medicine from the University of Aachen (1987). Prior to her selection as an astronaut in 1987, Dr. Walpot was a resident physician at the anesthesiology department of the Aachen university clinic. She is also a world-class amateur swimmer, participating in the 1976 Olympics, 1977 European Championships (bronze medal), and the 1978, 1979 and 1981 World Championships. She is now training for STS-52, the Spacelab D-2 mission, awaiting final selection of the crew.

Ulrich Walter; civilian; M.D.; born February 9, 1954 in the Iserlohn, Federal Republic of Germany; married, one child.

Received diploma in experimental physics (1980) and doctorate in solid-state physics from the University of Cologne (1985). Walter has held postdoctoral positions at Argonne National Laboratory and the University of California at Berkeley. He was chosen as a German astronaut in 1987, and is now training for the STS–52 (Spacelab D–2), awaiting final selection of the crew.

Taylor G. Wang; civilian; born June 16, 1940, Shanghai, China; married, two children. **Spaceflight: STS 51-B**

Received bachelor (1967), master (1968), and doctorate (1971) in physics from the University of California at Los Angeles. He joined the Jet Propulsion Laboratory in 1972 and is currently program manager for materials processing in space, and has been responsible for development of containerless processing in space. Dr. Wang flew on STS 51-B (Spacelab 3) as the principle investigator for several studies including drop and liquid bubble dynamics and containerless processing. He is currently a professor at Vanderbilt University.

ROBERT WOOD

Robert Jackson Wood; civilian; born June 26, 1957, Fitchburg, Massachusetts (but considers Lyndeborough, New Hampshire his home); married, three children.

Received bachelor of science in physics from the Honors Tutorial College at Ohio University (1978), and master of science in physics from MIT (1980). Worked as a senior research scientist at the Jarrellash Division of Fisher Scientific, and then joined McDonnell Douglas in 1982. He was the lead software engineer for the EOS program, serving as the backup for STS 41-D, 51-D and 61-B. Later he became the Manager for Accelerator Software for the Neutral Particle Beam Integrated Experiment, then was Manager of Air Vehicle Software for the National Aero-Space Plane program, and is now Program Manager for MUGS (Multipurpose Universal Gunner Sight) in the Combat Systems Division.

TABLE 3-1.—SUMMARY OF PAYLOAD SPECIALISTS AND PASSENGERS ON U.S. MISSIONS

Name	Mission*	Date	Payload	Sponsor	Prime/Backup
Acton	STS 51-F	1985	Spacelab 2	Lockheed	Prime
Al-Bassam	STS 51-G	1985	Arabsat 1-B	Saudi Arabia	Backup
Al-Saud	STS 51-G	1985	Arabsat 1-B	Saudi Arabia	Prime
Bartoe	STS 51-F	1985	Spacelab 2	Naval Research Lab	Prime
Baudry	STS 51-G	1985	FEE/FPE	France/CNES	Prime
Bechis	[STS-42]	1990	Starlab	SDIO	Backup
Boeson	[STS-42]	1990	Starlab	SDIO	Backup
Bondar	[STS-45]	1991	IML-1	Canada/NRCC	
Booen	STS 51-J	1985	Classified	U.S. Air Force	Backup
Brummer	[STS-52]	1991	Spacelab D-2	Germany/DLR	
Butterworth	STS 51-L	1986	FDE	Hughes	Backup
Cenker	STS 61-C	1986	Satcom	RCA	Prime
Chappell	[STS-47]	1991	Atlas-1	MSFC	Backup
Chretien	STS 51-G	1985	FEE/FP	France/CNES	Backup
Crombie	[STS-39]	1990	IBSS/Cirris	U.S. Air Force	Backup
Crouch	[STS-45]	1991	IML-1	NASA Headquarters	
Doi	[STS-48]	1991	Spacelab-J	Japan/NASDA	
Durrance	[STS-35]	1990	Astro-1	Johns Hopkins Univ.	Prime
Furrer	STS 61-A	1985	Spacelab D-1	Germany/DLR	Prime
Gaffney	[STS-40]	1990	SLS-1	University of Texas	Prime
Garn	STS 51-D	1985		U.S. Congress	Prime
Garneau	STS 41-G	1984	CANEX	Canada/NRCC	Prime
Hughes-Fulford	[STS-40]	1990	SLS-1	Veterans Admin.	Prime
Jarvis	STS 51-L	1986	FDE	Hughes	Prime
Johnston	STS 51-B	1985	Spacelab 3	MSFC	Backup
LaComb	[STS-42]	1990	Starlab	USAF/SDIO	Prime
Lampton	STS-9	1983	Spacelab 1	Univ. of California	Backup
	[STS-47]	1991	Atlas-1	Univ. of California	Prime
Lichtenberg	STS-9	1983	Spacelab 1	M.I.T.	Prime
	[STS-47]	1991	Atlas-1	Lockheed	Prime
MacLean	[STS-53]	1992	CANEX-2	Canada/NRCC	Prime
Magilton	STS 61-C	1986	Satcom	RCA	Backup
McAuliffe	STS 51-L	1986		Teacher in Space	Prime
Merbold	STS-9	1983	Spacelab 1	ESA	Prime
	STS 61-A	1985	Spacelab D-1	ESA	Backup
	[STS-45]	1991	IML-1	ESA	
Messerschmid	STS 61-A	1985	Spacelab D-1	Germany/DLR	Prime
Mohri	[STS-48]	1991	Spacelab J	Japan/NASDA	
Money	[STS-45]	1991	IML-1	Canada/NRCC	
Morgan	STS 51-L	1986		Teacher in Space	Backup
Naito-Mukai	[STS-48]	1991	Spacelab J	Japan/NASDA	
Nelson	STS 61-C	1986		U.S. Congress	Prime
Neri Vela	STS 61-B	1985	Morelos	Mexico	Prime
Nordsieck	[STS-35]	1990	Astro-1	Univ. of Wisconsin	Backup
Ockels	STS-9	1983	Spacelab 1	ESA	Backup
	STS 61-A	1985	Spacelab D-1	ESA	Prime
Pailes	STS 51-J	1985	Classified	U.S. Air Force	Prime
Parise	[STS-35]	1990	Astro-1	Computer Sci. Corp.	Prime
Payton	STS 51-C	1985	Classified	U.S. Air Force	Prime
Peralta y Fabi	STS 61-B	1985	Morelos	Mexico	Backup
Prinz	STS 51-F	1985	Spacelab 2	Naval Research Lab	Backup
Puz	[STS-42]	1992	Starlab	SDIO	Prime
Schlegal	[STS-52]	1991	Spacelab D-2	Germany/DLR	
Scully-Power	STS 41-G	1984	Oceanography	U.S. Navy	Prime
Simon	STS 51-F	1985	Spacelab 2	National Solar Obs.	Backup
Thiele	[STS-52]	1991	Spacelab D-2	Germany/DLR	
Thirsk	STS 41-G	1985	CANEX	Canada/NRCC	Backup
Trinh	STS 51-B	1985	Spacelab 3	Jet Propulsion Lab	Backup
Tryggvason	[STS-53]	1992	CANEX-2	Canada/NRCC	Backup
van den Berg	STS 51-B	1985	Spacelab 3	EG&G Corporation	Prime
Walker	STS 41-D	1984	CFES	McDonnell-Douglas	Prime
	STS 51-D	1985	CFES	McDonnell-Douglas	Prime

TABLE 3-1.—SUMMARY OF PAYLOAD SPECIALISTS AND PASSENGERS ON U.S. MISSIONS—Continued

Name	Mission*	Date	Payload	Sponsor	Prime/Backup
	STS 61-B	1985	CFES	McDonnell-Douglas	Prime
Walpot	[STS-52]	1991	Spacelab D-2	Germany/DLR	
Walter	[STS-52]	1991	Spacelab D-2	Germany/DLR	
Wang	STS 51-B	1985	Spacelab 3	Jet Propulsion Lab	Prime
Wood	STS 41-D	1984	CFES	McDonnell-Douglas	Backup
	STS 51-D	1985	CFES	McDonnell-Douglas	Backup
	STS 61-B	1985	CFES	McDonnell-Douglas	Backup

* Missions in brackets are scheduled on the current NASA shuttle launch manifest; actual launch date may very.

Acronyms:

CFES = Continuous Flow Electrophoresis System; DLR = German Flight Research Institute; ESA = European Space Agency; IML = International Microgravity Laboratory; MSFC = Marshall Space Flight Center; NASDA = National Space Development Agency of Japan; NRCC = National Research Council of Canada; SDIO = Strategic Defense Initiative Organization; SLS = Spacelab Life Sciences.

Names in bold are those individuals who had made spaceflights by June 30, 1989.

TABLE 3–2.—CUMULATIVE PAYLOAD SPECIALIST AND PASSENGER SPACE TIME ON U.S. MISSIONS

Name	Flight(s)	Total time in space (hr:min)	EVA		
			Space	Lunar	Total
Acton	STS 51–F	190:45			
Al-Saud (S. Arabia)	STS 51–G	169:39			
Bartoe	STS 51–F	190:45			
Baudry (France)	STS 51–G	169:39			
Cenker	STS 61–C	146:04			
Furrer (FRG)	STS 61–A	168:44			
Garn	STS 51–D	167:55			
Garneau (Canada)	STS 41–G	197:24			
Lichtenberg	STS–9	247:47			
Merbold (ESA)	STS–9	247:47			
Messerschmid (FRG)	STS 61–A	168:44			
Nelson, B.	STS 61–C	146:04			
Neri Vela (Mexico)	STS 61–B	165:05			
Ockels (ESA)	STS 61–A	168:44			
Pailes	STS 51–J	97:47			
Payton	STS 51–C	73:33			
Scully-Power	STS 41–G	197:24			
van den Berg	STS 51–B	168:09			
Walker, C.	STS 41–D STS 51–D STS 61–B	477:57			
Wang	STS 51–B	168:09			
20 Payload Spec. and Passengers	11 Missions	3728:05			

Includes U.S. and foreign payload specialists and passengers flown on U.S. missions. Twelve are from the United States; eight from other countries. STS=Space Transportation System (the space shuttle). ESA=European Space Agency; FRG=Federal Republic of Germany.

Gregory Jarvis, a payload specialist from Hughes Aircraft, and S. Christa McAuliffe, NASA Teacher in Space, died in the January 28, 1986, STS 51–L ***Challenger*** tragedy. That mission is not counted as a spaceflight in this report, so they are not included in this list of cumulative time in space.

PART II: SOVIET MISSIONS

CHAPTER FOUR—SOVIET COSMONAUTS

INTRODUCTION

Information on cosmonauts from the Soviet Union is not as readily available as it is for their American counterparts. In general, until a cosmonaut is launched into space, the Soviets do not release information about him or her. After launch, basic information typically is released, but new material is not published unless the cosmonaut flies again. Most of the data in the following two chapters were gleaned by poring through Soviet articles for tidbits of information over the years.

With the advent of *glasnost,* however, more information is gradually becoming available. This chapter contains many names of cosmonauts, previously unknown, that have been provided by Mr. Rex Hall in England through detailed study of Soviet literature and correspondence between himself and individuals in the Soviet space program. For many of these newly identified cosmonauts, no further information is available, however, so while they are listed in Tables 4-1 and 4-2, the cosmonauts are not included in the biographical section. *Glasnost* still has not resulted in a public listing of all those individuals who have been members of the cosmonaut corps over the years, or even of those who are now on the active roster, however. Thus, this chapter still does not contain a complete listing of cosmonauts.

The preceding sections on American astronauts show that they joined their respective programs in distinct groups. It is probable that the same situation is true in the Soviet Union. Table 4-1 shows the years that the cosmonauts were chosen according to reports in the Soviet press and Mr. Hall's research. It is difficult to assess the flight status of cosmonauts since such announcements are rarely made. Thus, the "status" column in Table 4-1 merely represents a "best guess" estimate.[1]

In the biographies and tables in Chapters 4 and 5, many missions are designated by two flight numbers, such as Soyuz 37/36. The first number indicates the spacecraft on which a crew member was launched into space; the second is the spacecraft on which (s)he returned to Earth. This designation system is necessitated by the Soviet practice of switching spacecraft during space station missions so long duration crews have a relatively fresh spacecraft for the return to Earth. If only one spacecraft is listed (Soyuz 15, for example), the crew member went into and returned from space using it. Vostok, Voskhod, Soyuz (and its variants Soyuz T and Soyuz TM) are all spacecraft used to take cosmonauts into space and return them to Earth. Salyut and Mir are Soviet space stations. Thus, a mission listed as Soyuz 37/Salyut 6/Soyuz 36 indicates that a crew member was launched on Soyuz 37, docked with Salyut 6, and returned to Earth on Soyuz 36 (which had been previously docked at the space station).

---

[1] Another source of information on Soviet cosmonauts is Gordon Hooper's *The Soviet Cosmonaut Team,* published in Suffolk, England by Richard Clay Ltd., [1986?], 320 pp.

Transliterating the cyrillic alphabet into English can be done following several different sets of rules. Thus, the spellings used here may be slightly different from those in other reference works on Soviet cosmonauts (Yuriy instead of Yuri, Kovalenok instead of Kovalyonok, for example).

Since the beginning of the Space Age, there has been speculation that there were secret deaths of Soviet cosmonauts in spaceflights during the early years. It seems unlikely, however, that any cosmonauts other than the four identified in this report (Dobrovolskiy, Komarov, Patsayev and Volkov) have been killed in spaceflights. Soviet missions require positioning support ships worldwide to provide communications with the crew. Any suggestion that undetected flights were made must include the supposition that no support ships were assigned to provide communication links with the crew, an unlikely event. This, and the lack of any other evidence, suggest that these stories are speculation and rumor only, with no basis in fact.

TABLE 4-1.—STATUS OF SOVIET COSMONAUTS BY GROUP

Name	Year of first flight	Status
1960 Cosmonaut Selection:		
(Pilots)		
Anikeyev*	none	Resigned
Bel'yayev	1965	Deceased
Bondarenko*	none	Deceased
Bykovskiy	1963	Resigned
Filatyev*	none	Resigned
Gagarin	1961	Deceased
Gorbatko	1969	Resigned
Kartashov*	none	Resigned
Khrunov	1969	Resigned
Komarov	1964	Deceased
Leonov	1965	Resigned
Nelyubov*	none	Deceased
Nikolayev	1962	Resigned
Popovich	1962	Resigned
Rafikov*	none	Resigned
Shonin	1961	Resigned
Titov, G.	1961	Resigned
Varlamov*	none	Deceased
Volynov	1969	Resigned
Zaikin*	none	Resigned
1962 Cosmonaut Selection:		
(Women)		
Kuznetsova*	none	Resigned
Ponomaryova*	none	Resigned
Solovyeva*	none	Resigned
Tereshkova	1963	Resigned
Yerkina*	none	Resigned
1963 Cosmonaut Selection:		
(Pilots)		
Dobrovolskiy	1971	Deceased
Filipchenko	1969	Resigned
Gubarev	1975	Resigned
Kuklin*	none	Resigned
Shatalov	1969	Resigned
Vorobyov*	none	Resigned
(Engineers)		
Artyukhin	1974	Resigned
Demin	1974	Resigned
Kolodin*	none	Resigned
Zholobov	1976	Resigned
(Others)		
Buinovskiy*	none	Resigned
Gulyayev*	none	Resigned
Kugno*	none	Resigned
Matinchenko*	none	Resigned
Voronov*	none	Resigned
1964 Cosmonaut Selection:		
(Pilots)		
Beregovoy	1968	Resigned
(Scientists)		
Feoktistov	1964	Resigned
Katys*	none	Resigned
Lazarev [1]	1973	Resigned
Sorokin*	none	Deceased
Yegorov	1964	Resigned

TABLE 4-1.—STATUS OF SOVIET COSMONAUTS BY GROUP—Continued

Name	Year of first flight	Status
1965 Cosmonaut Selection: [2]		
(Pilots)		
Kizim	1980	Resigned
Klimuk	1973	Resigned
Sarafanov	1974	Resigned
Voloshin*	none	Resigned
Zudov	1976	Resigned
(Engineers)		
Glazkov	1977	Resigned
Lisun*	pending	Active
Preobrazhenskiy*	none	Resigned
Rozhdestvenskiy	1976	Resigned
(Others)		
Golovanov*	none	Resigned
Iliyn*	none	Resigned
Kisilev*	none	Resigned
Letunov*	none	Deceased
Senkevich*	none	Resigned
1966 Cosmonaut Selection:		
(Engineers)		
Anokhin*	none	Deceased
Grechko	1975	Resigned
Kubasov	1969	Resigned
Makarov	1973	Resigned
Volkov, V.	1969	Deceased
Yeliseyev	1969	Resigned
1967 Cosmonaut Selection:		
(Pilots)		
Alekseyev*	none	Resigned
Kovalenok	1977	Resigned
Kozelskiy*	pending	Active
Lyakhov	1979	Active
Malyshev	1980	Active
(Engineers)		
Rukavishnikov	1971	Resigned
Sevast'yanov	1970	Active
1969 Cosmonaut Selection:		
(Engineers)		
Patsayev	1971	Deceased
Yazdovskiy*	none	Resigned
1970 Cosmonaut Selection:		
(Pilots)		
Berezovoy	1982	Active
Dzhanibekov	1978	Resigned
Isaulov*	pending	Active
Popov	1980	Resigned
Romanenko	1977	Resigned
(Engineers)		
Andreyev	none	Resigned
Ilarionov	pending	Active
Ivanchenkov	1978	Active
Ponomaryov*	none	Resigned

TABLE 4-1.—STATUS OF SOVIET COSMONAUTS BY GROUP—Continued

Name	Year of first flight	Status
1972 Cosmonaut Selection:		
(Engineers)		
Lebedev	1973	Active
Makrushin*	pending	Active
(Scientists)		
Polyakov	1988	Active
Smiriny*	pending	Active
1973 Cosmonaut Selection:		
(Engineers)		
Aksenov	1976	Resigned
Ryumin	1977	Resigned
Strekalov	1980	Active
1976 Cosmonaut Selection:		
Arzamazov*	pending	Active
Salei*	none	Resigned
Solovyev, A.	1988	Active
Titov, V.	1983	Active
Vasyutin	1985	Resigned
Volkov, A.	1985	Active
1977 Cosmonaut Selection:		
Atkov	1984	Resigned
1978 Cosmonaut Selection:		
(Pilots)		
Grekov*	pending	Active
Viktorenko	1987	Active
(Engineers)		
Aleksandrov, A.	1983	Active
Balandin*	pending	Active
Laveikin	1987	Active
Manarov	1987	Active
Savinykh	1981	Resigned
Serebrov	1982	Active
Solovyev, V.	1984	Resigned
(Shuttle Pilots) [3]		
Kononenko*	none	Deceased
Levchenko	1987	Deceased
Stankyavichus*	pending	Active
Volk	1984	Active
1980 Cosmonaut Selection:		
(Women)		
Ivanova*	pending	Active
Pronina*	pending	Active
Savitskaya	1982	Active
1982 Selection:		
(Shuttle Pilot)		
Shchukin	none	Deceased
1985 Cosmonaut Selection:		
Krikalev	1988	Active
1987 Cosmonaut Selection: [4]		
Kaleri	pending	Active
Zaitsev	pending	Active

TABLE 4-1.—STATUS OF SOVIET COSMONAUTS BY GROUP—Continued

Name	Year of first flight	Status
Other Selections: [5]		
Cosmonauts (No Group Identified)		
Bacharin*	pending	Active
Boroday*	pending	Active
Dobrokvashina*	pending	Active
Shuttle Pilots (No Group Identified)		
Sheffer*	pending	Active
Sultanov*	pending	Active
Tolboev*	pending	Active
Tresvyatskiy*	pending	Active
Zabolotskiy*	pending	Active

---

* No complete biography of this cosmonaut is available. Recently released data compiled by Mr. Rex Hall in England indicates that these cosmonauts were members of the groups noted, but have never flown any missions. Most have now resigned from the cosmonaut corps, while others are awaiting a flight assignment.

[1] Lazarev was originally selected in 1964 and was the backup for Yegorov on Voskhod 1. However, he then stood down and was re-selected in 1966. He is listed in this report in the original group with which he was selected.

[2] This was the Voskhod 1 training group. In addition to pilots and engineers, three doctors and two journalists were chosen.

[3] The shuttle pilot groups are separate from the main cosmonaut corps, and are under the command of the Flight Research Center of the Ministry of Aviation Industry.

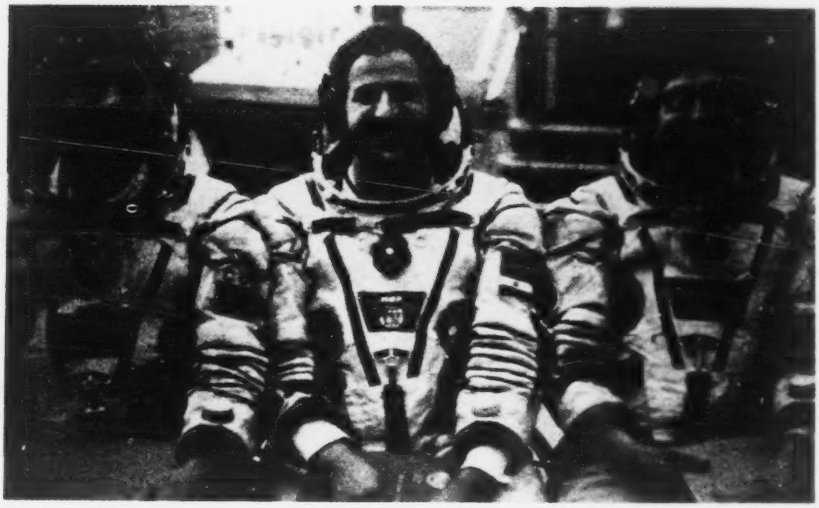
[4] In 1987 it was reported that a group of pilots had started basic cosmonaut training. They were not individually identified.

[5] In 1988, it was reported that a group of 12 men had started basic cosmonaut training. They were identified as doctors, biologists, and chemists. Most likely they are to support expanded space station operations.

BIOGRAPHIES OF SOVIET COSMONAUTS

Vladimir Viktorovich Aksenov; civilian; born February 1, 1935, Gibilitskiy Village, Ryazan Region; married, two children. **Spaceflights: Soyuz 22, Soyuz T-2**

Graduated from an Air Force Officer's School (1957), worked as a design engineer with Sergei Korolev, graduated from the All-Union Polytechnical Institute with an engineering degree (1963), worked on space flight design, including hyperbolic simulation flights, and joined the cosmonaut corps in 1973. He was the flight engineer for Soyuz 22, and for Soyuz T-2/Salyut 6. Aksenov resigned from the cosmonaut corps in 1981 and is now working in a research institute.



Aleksandr Pavlovich Aleksandrov (on right); civilian, born February 20, 1943, Moscow; married, one child. **Spaceflights: Soyuz T-9, Soyuz TM-3**

Completed service in the Soviet Army in 1964, then began work in a design bureau. Graduated from the Bauman Higher Technical School in Moscow in 1969. Participated in the development of spacecraft control systems. Entered cosmonaut training in 1978. Served on backup crew for Soyuz T-8; flew as the flight engineer on Soyuz T-9/Salyut 7; was backup flight engineer for Soyuz T-13 and Soyuz T-15; and was flight engineer on Soyuz TM-3/Mir.

Boris Dmitriyevich Andreyev; civilian; born October 6, 1940, Moscow; married, two children.

Graduated from Bauman Higher Technical School in Moscow, joined a design bureau in 1965, and joined the cosmonaut corps in 1970. He served as a member of several backup crews: Soyuz 16, Soyuz 19 (the Apollo-Soyuz Test Project), Soyuz 22, Soyuz 35 and Soyuz T-4. He resigned from the cosmonaut corps in 1982.

Yuriy Petrovich Artyukhin; Colonel Engineer, Soviet Air Force; born July 22, 1930, Pershutino, near Moscow; married, two children. **Spaceflight: Soyuz 14**

Attended Serpukhov Air Force Technical School, served in the Air Force for several years, graduated from Zhukovskiy Air Force Engineering Academy (1958), then worked at the scientific research laboratory of that academy. He joined the cosmonaut corps in 1963. He was the flight engineer on Soyuz 14/Salyut 3. Artyukhin resigned from the cosmonaut corps in 1979 and is now retired from the Soviet Air Force.

NO PHOTOGRAPH AVAILABLE

Oleg Yuriyevich Atkov; civilian; born May 9, 1949, Khvorostyanka, Khvorostyanka District, Kuybyshev region; married. **Spaceflight: Soyuz T-10**

Graduated from Sechenov Medical Institute in Moscow in 1973 and continued training at the All-Union Cardiology Research Center, where he consulted with the Cosmonaut Training Center. At the Myasnikov Institute of Cardiology, he served as head of the group on ultrasonic methods for the study of heart disease. Atkov was selected for the cosmonaut corps in 1977, and flew on Soyuz T-10/Salyut 7 as cosmonaut-researcher. He resigned as a cosmonaut in 1984 and is now the head of the All-Union Cardiology Research Center.

Pavel Ivanovich Bel'yayev; Colonel, Soviet Air Force; born June 26, 1925, Chelishchevo, Vologda region; died January 10, 1970, from complications following an operation for stomach ulcers; was married, two children. **Spaceflight: Voskhod 2**

Attended the Red Banner Military Aviation Academy, and joined the cosmonaut corps in 1960. He was the command pilot of Voskhod 2.

Georgiy Timofeyevich Beregovoy; Lieutenant General, Soviet Air Force; born April 15, 1921, village of Fedorovka, Poltava region; married, two children. **Spaceflight: Soyuz 3**

Attended the Military Aviation School for Pilots at Lugansk. He served in the Red Army Air Force as a pilot during the war and flew 185 sorties in Ilyushin, single-seat, attack bombers, and was awarded his first Hero of the Soviet Union gold star. After the war, he worked as a test pilot, and graduated from the Red Banner Military Aviation Academy in 1956. He joined the cosmonaut corps in 1964 and was the pilot of Soyuz 3. From 1972–1987, he was the Director of the Gagarin Cosmonaut Training Center. He is now retired, and has written several technical and popular books about aviation, space flight, and space flight equipment.

NO PHOTOGRAPH AVAILABLE

Anatoliy Nikolayevich Berezovoy; Colonel, Soviet Air Force; born April 11, 1942, Enem; married, two children. **Spaceflight: Soyuz T-5/T-7**

Graduated from flight school in 1965. He joined the cosmonaut corps in 1970 and served as part of the backup crews for Soyuz 21, Soyuz 23, and Soyuz 24. He made his first spaceflight as commander for Soyuz T-5/Salyut 7/Soyuz T-7, then was on the backup crews for Soyuz T-11 and Soyuz TM-6.

Valeriy Fedorovich Bykovskiy; Colonel, Soviet Air Force; born August 2, 1934, Pavolo-Posad, near Moscow; married, two children. **Spaceflights: Vostok 5, Soyuz 22, Soyuz 31/29**

Joined the cosmonaut corps in 1960, and graduated from the Zhukovskiy Air Force Engineering Academy (1968). He was the backup pilot for Vostok 3, pilot of Vostok 5, was chief of cosmonaut training for the Apollo-Soyuz Test Project, and was command pilot of Soyuz 22 and of the Soyuz 31/Salyut 6/Soyuz 29 mission. He served on the backup crew for Soyuz 37 and then resigned from the cosmonaut corps. He is now the head of the Soviet Scientific and Cultural Center in East Berlin.

Lev Stepanovich Demin; Colonel Engineer, Soviet Air Force; born January 11, 1926, Moscow; married, two children. **Spaceflight: Soyuz 15**

Graduated from an Air Force Communications School, Zhukovskiy Air Force Engineering Academy (1956), earned a degree as candidate of technical sciences (1963), and joined the cosmonaut corps in 1963. He was on the backup crew for Soyuz 14, and served as flight engineer on Soyuz 15/Salyut 3. Demin resigned from the cosmonaut corps in 1978 and is now retired from the Soviet Air Force.

Georgiy Timofeyevich Dobrovolskiy; Lieutenant Colonel, Soviet Air Force; born June 1, 1928, Odessa; died June 29, 1971, during Soyuz 11 reentry; was married, two children. **Spaceflight: Soyuz 11**

Graduated from the Chuguyev Air Force School, and joined the cosmonaut corps in 1963. He was the command pilot of the Soyuz 11/Salyut 1 mission.

Vladimir Aleksandrovich Dzhanibekov; Major General, Soviet Air Force; born May 13, 1942, settlement of Iskandar, Bostanlik district, Tashkent region; married, two children. **Spaceflights: Soyuz 27, Soyuz 39, Soyuz T-6, Soyuz T-12, Soyuz T-13**

Graduated from the Higher Military Aviation School for Pilots at Yeysk in 1965. He served as flight instructor in the Air Force and joined the cosmonaut corps in 1970. He served on the backup crews for Soyuz 16 and Soyuz 19 (the Apollo-Soyuz Test Project), and made his first spaceflight as commander of Soyuz 27/Salyut 6. He was backup commander for Soyuz 36, then was the commander for the Soyuz 39/Salyut 6, Soyuz T-6/Salyut 7, Soyuz T-12/Salyut 7, and Soyuz T-13/Salyut 7 missions. He stepped down as a cosmonaut in 1985 and is now a division head at Gagarin Cosmonaut Training Center.

Konstantin Petrovich Feoktistov; civilian; born February 7, 1926, Voronezh; married, four children. **Spaceflight: Voskhod 1**

Graduated from the Bauman Higher Technical School in Moscow with a master of science degree in engineering (1949) and now holds the degree of doctor of technical sciences. He joined the cosmonaut corps in 1964 and flew as a technical scientist on Voskhod 1. Dr. Feoktistov resigned from the cosmonaut corps in 1966 and returned to high-level engineering and played a major role in designing the Salyut space stations. He is currently a professor of design.

Anatoliy Vasilyevich Filipchenko; Major General, Soviet Air Force; born February 26, 1928, Davydovka village, Voronezh region; married, two children. **Spaceflights: Soyuz 7, Soyuz 16**

Graduated from Chuguyev Air Force School, from the Red Banner Air Force Academy (1961) and joined the cosmonaut corps in 1963. He was backup command pilot for Soyuz 5; command pilot on Soyuz 7; backup commander for Soyuz 9; commander of Soyuz 16; and was a member of the backup crew for Soyuz 19 (the Apollo-Soyuz Test Project). He stepped down as a cosmonaut in 1979, worked at the Gagarin Cosmonaut Training Center, and is now retired from the Soviet Air Force.

Yuriy Alekseyevich Gagarin; Colonel, Soviet Air Force; born, March 9, 1934, Gzhast district, Smolensk region; died March 27, 1968, in the crash of a jet trainer; was married, two children.
Spaceflight: Vostok 1

Attended Aviation School in Orenburg, Zhukovskiy Air Force Engineering Academy, and joined the cosmonaut corps in 1960. He was the pilot of Vostok 1, becoming the first man in space, and backup pilot for Soyuz 1.

Yuriy Nikolayevich Glazkov; Colonel Engineer, Soviet Air Force; born October 2, 1939, Moscow; married. **Spaceflight: Soyuz 24**

Graduated from the Higher Military Aviation School for Pilots in Kharkhov (1962), worked as an engineer in the Soviet Air Force, and joined the cosmonaut corps in 1965. He was the backup flight engineer for Soyuz 21 and Soyuz 23, and flew as flight engineer for Soyuz 24/Salyut 5. He is currently a Deputy Director of the Gagarin Cosmonaut Training Center.

Viktor Vasilyevich Gorbatko; Major General, Soviet Air Force; born December 3, 1934, Kuban River region, North Caucasus; married, two children. **Spaceflights: Soyuz 7, Soyuz 24, Soyuz 37/36**

Entered the Bataysk Air Force near Rostov in 1953, joined the cosmonaut corps in 1960, and graduated from the Zhukovskiy Air Force Engineering Academy (1968). He was replaced as backup for Voskhod 2 due to medical reasons; was backup pilot for Soyuz 5; flew as the research engineer for Soyuz 7; was backup pilot for Soyuz 21 and Soyuz 23; flew as pilot for Soyuz 24/Salyut 5; was backup commander for Soyuz 31; and was commander of the Soyuz 37/Salyut 6/Soyuz 36 mission. He resigned from the cosmonaut corps in 1980 and is now a faculty head at the Zhukovskiy Air Force Engineering Academy.

Georgiy Mikhaylovich Grechko; civilian; born May 25, 1931, Leningrad; married, two children. **Spaceflights: Soyuz 17, Soyuz 26, Soyuz T-14**

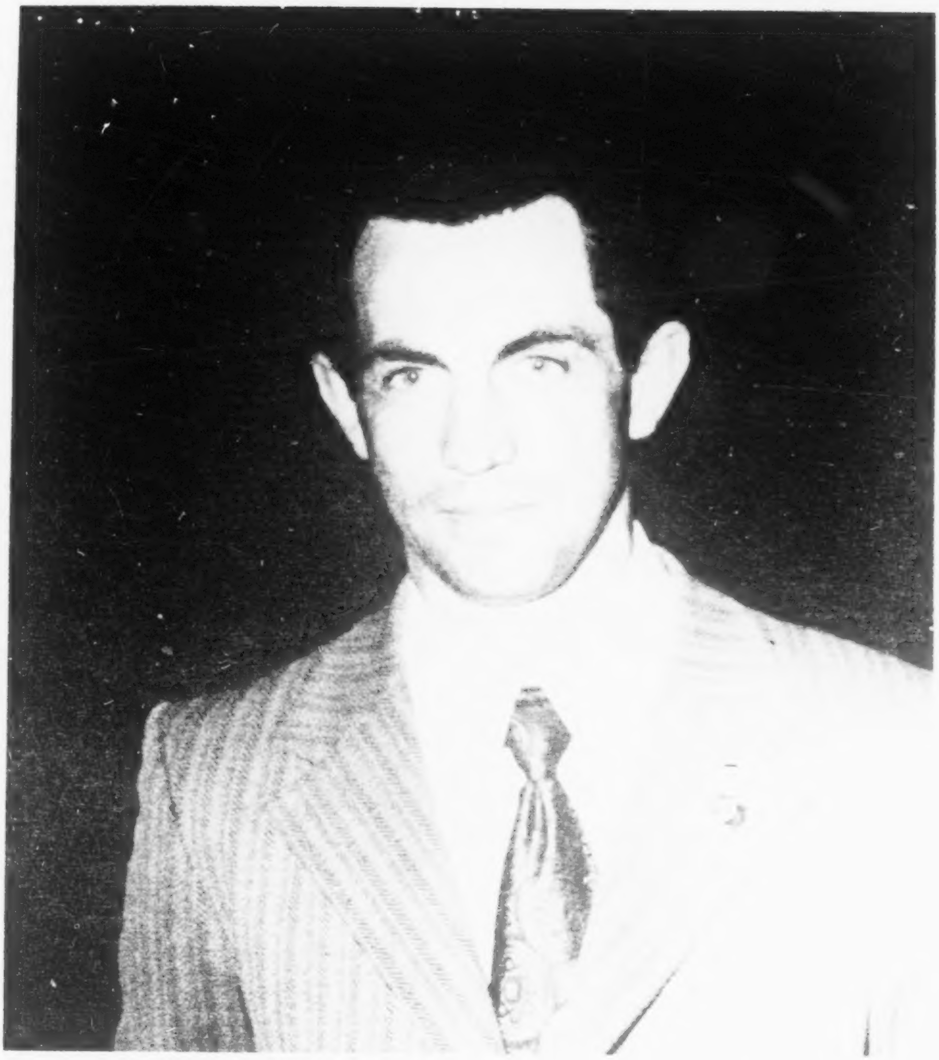
Graduated from the Institute of Mechanics in Leningrad in 1955, then worked in a design bureau, participating in the design and development of space flight equipment. In 1967, he received a master of technical sciences degree on the basis of work connected with landing automatic stations on the Moon. In 1984, he obtained a doctorate in the physico-mathematical sciences. He joined the cosmonaut corps in 1966, and served on the backup crews for Soyuz 9 and Soyuz 12; was the flight engineer on Soyuz 17/Salyut 4, and Soyuz 26/Salyut 6; was the backup flight engineer for Soyuz T-11; and was flight engineer for Soyuz T-14/Salyut 7. Grechko resigned from the cosmonaut corps in 1986 and is working as a lab specialist in astrophysics. He also serves as vice-chairman of the Soviet Committee for Defending Peace.

Aleksei Aleksandrovich Gubarev; Major General, Soviet Air Force; born March 29, 1931, Kuibyshev, on the Volga; married, two children. **Spaceflights: Soyuz 17, Soyuz 28**

Graduated from the Naval Air Force School, Red Banner Air Force Academy, and joined the cosmonaut corps in 1963. He was part of the backup crew for Soyuz 12, and was command pilot for Soyuz 17/Salyut 4 and Soyuz 28/Salyut 6. He resigned from the cosmonaut corps in 1982 and returned to active duty in the Soviet Air Force.

Valeriy Vasilyevich Illarionov; Colonel Engineer, Soviet Air Force; born July 2, 1939.

Illarionov graduated from the Zhukovskiy Air Force Academy and joined the cosmonaut corps in 1970. He served as a Capcom (capsule communicator) in Houston during the Apollo-Soyuz Test Project and was identified at that time as a cosmonaut. He remains an active cosmonaut and is currently working on mission simulations.



Aleksandr Sergeyevich Ivanchenkov; civilian; born September 28, 1940, Ivanteyevka, near Moscow; married, one child. **Spaceflights: Soyuz 29/31, Soyuz T-6**

Graduated from the Moscow Aviation Institute, joined a design bureau in 1964, and joined the cosmonaut corps in 1970. He was on the backup crews for Soyuz 16, Soyuz 19 (the Apollo-Soyuz Test Project), Soyuz 25, Soyuz 26 and Soyuz 27. He made his first spaceflight as flight engineer for the Soyuz 29/Salyut 6/Soyuz 31 mission, and was flight engineer for Soyuz T-6/Salyut 7.

NO PHOTOGRAPH AVAILABLE

Aleksandr Yurevich Kaleri; civilian; born May 13, 1956 in Yurmala, Latvia.

Graduated from the Physics-Engineering Institute in Moscow in 1979. He joined the cosmonaut corp in 1987 and was backup flight engineer for Soyuz TM–4. Shortly thereafter, he was declared medically unfit for mission assignments, but remains a member of the cosmonaut corps.

Yevgeniy Vasiliyevich Khrunov; Colonel, Soviet Air Force; born September 10, 1933, Pruidy, near Tula; married, one child. **Spaceflight: Soyuz 4/5**

Graduated from Batay Military Aviation College (1956), joined the cosmonaut corps in 1960, graduated from the Zhukovskiy Air Force Engineering Academy (1968), and has since earned a master of science degree. He was the backup pilot of Voskhod 2 and the engineer pilot for both Soyuz 4 and 5, transferring from Soyuz 5 to Soyuz 4 in space during the flight. He was a member of the backup crew for Soyuz 38, and resigned as a cosmonaut in 1981, returning to active duty with the Soviet Air Force. He has co-authored a book, *Man as Operator in Cosmic Flight.*

Leonid Denisovich Kizim; Colonel, Soviet Air Force; born August 5, 1941, Krasniy Liman, Donetsk region; married, two children.

Spaceflights: Soyuz T–3, Soyuz T–10, Soyuz T–15

Graduated from the Leninskiy Komsomol Higher Military Aviation School for Pilots at Chernigov in 1963, and then served in the Air Force. He joined the cosmonaut corps in 1965, and graduated from the Gagarin Military Aviation Academy in 1975. He was on the backup crew for Soyuz T–2; made his first flight as commander of Soyuz T–3/Salyut 6; was backup commander for Soyuz T–6; commander of Soyuz T–10/Salyut 7, and of the Soyuz T–15/Mir/Salyut 7 mission, ferrying between the two space stations. He has resigned from the cosmonaut corps and is now teaching at the Soviet Air Force Academy.

Pyotr Il'yich Klimuk; Major General, Soviet Air Force; born July 10, 1942, Komarovka Village, Byelorussia; married, one child.
Spaceflights: Soyuz 13, Soyuz 18, Soyuz 30

Graduated from the Higher Military Aviation School for Pilots at Chernigov (1964), served in the Air Force, and joined the cosmonaut corps in 1965. He was the command pilot of Soyuz 13, Soyuz 18/Salyut 4, and of Soyuz 30/Salyut 6. He resigned from the cosmonaut corps in 1978. Klimuk is now the Deputy Director for Political Affairs at the Gagarin Cosmonaut Training Center.

Vladimir Mikhaylovich Komarov; Colonel Engineer, Soviet Air Force; born March 16, 1927, Moscow; died April 24, 1967, when the Soyuz 1 parachutes tangled during descent; was married, two children. **Spaceflights: Voskhod 1, Soyuz 1**

Attended Moscow Air Force School, Third Sassov Air Force School, Serov Flying School in Bataisk, and the Zhukovskiy Air Force Engineering Academy. He joined the cosmonaut corps in 1960. He was backup pilot for Vostok 4, command pilot of Voskhod 1, and pilot of Soyuz 1.

Vladimir Vasilyevich Kovalenok; Major General, Soviet Air Force; born March 3, 1942, Beloye, Minsk Region; married, two children. **Spaceflights: Soyuz 25, Soyuz 29/31, Soyuz T-4**

Graduated from Balashov Higher Air Force School in 1963, became a crew commander on transport planes and an Air Force paratroop instructor, took part in controlling space flights, and graduated from the Gagarin Air Force Academy in 1976. He joined the cosmonaut corps in 1967, and was a member of the backup crew for Soyuz 18; commander for Soyuz 25/Salyut 6; on the backup crew for Soyuz 26 and Soyuz 27; and commander for the Soyuz 29/Salyut 6/Soyuz 31 and Soyuz T-4/Salyut 6 missions. He resigned from the cosmonaut corps and returned to duty in the Soviet Air Force.

NO PHOTOGRAPH AVAILABLE

Sergey Konstantinovich Krikalev; civilian; born August 27, 1958, Leningrad. **Spaceflight: Soyuz TM-7**

Completed studies at the Institute of Mechanics in Leningrad in 1981, then worked in a design bureau where he participated in the creation of new space technology devices. He is involved in sport aviation and holds a Master of Sport in sport aviation. He began cosmonaut training in 1985 and served as flight engineer on the Soyuz TM-7/Mir mission.

Valeriy Nikolayevich Kubasov; civilian; born January 7, 1935, Vyaznika; married, two children. **Spaceflights: Soyuz 6, Soyuz 19 (Apollo-Soyuz Test Project), Soyuz 36/35**

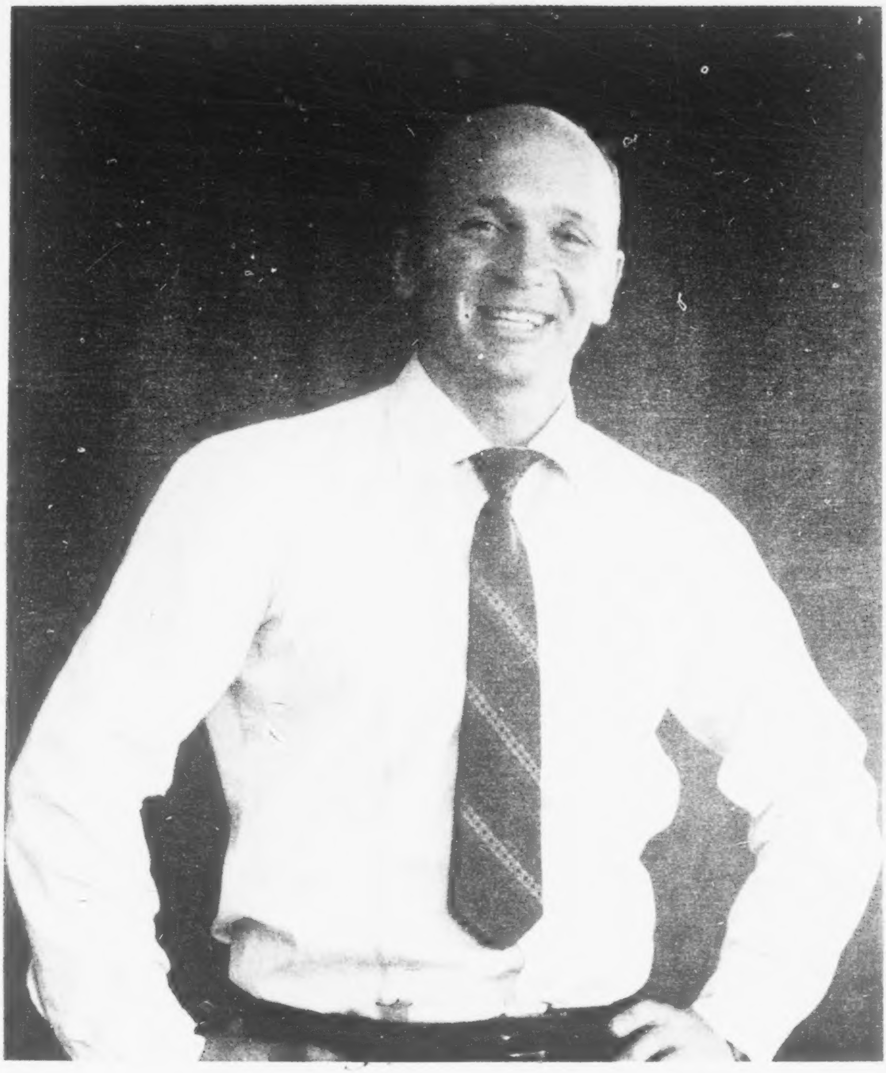
Graduated as a mechanical engineer for aircraft building from the Moscow Aviation School (1958), received a master of science degree (1968), and joined the cosmonaut corps in 1966. He was the backup technical scientist for Soyuz 5; flight engineer for Soyuz 6; on the backup crew for Soyuz 10 and Soyuz 11; flight engineer for Soyuz 19 (the Apollo-Soyuz Test Project); on the backup crew for Soyuz 30; and commander for the Soyuz 36/Salyut 6/Soyuz 35 mission. He has since resigned from the cosmonaut corps.

Aleksandr Ivanovich Laveikin (top); civilian; born April 21, 1951, Moscow. **Spaceflight: Soyuz TM-2/TM-3**

Graduated from the Bauman Higher Technical School in Moscow in 1974. and worked in the space technology design bureau formerly headed by S. P. Korolev, developing and testing new space flight structures. He joined the cosmonaut corps in 1978 and served as flight engineer on the Soyuz TM-2/Mir/Soyuz TM-3 mission, from which he returned early due to abnormal electrocardiogram readings (he was replaced by A. Aleksandrov).

Vasili Grigoriyevich Lazarev; Colonel, Soviet Air Force; born February 23, 1928, Altai region of Southern Siberia; married, one child. **Spaceflights: Soyuz 12, Soyuz 18A**

Received medical degree specializing in aviation medicine (1952), entered the Chuguyev Air Force School, and since 1954 has been an Air Force flyer, flight instructor, test pilot and flight equipment tester. Lazarev was originally selected for the cosmonaut corps in 1964 and served as the backup pilot for Voskhod 2. He left the cosmonaut corps, but was re-selected in 1966, and served as the backup pilot for Soyuz 9; command pilot of Soyuz 12; backup command pilot for Soyuz 17; command pilot of Soyuz 18A (the "April 5th Anomaly"); and backup commander of Soyuz T-3. He resigned from the cosmonaut corps and returned to duty in the Air Force, from which he is now retired.



Valentin Vitaliyevich Lebedev; civilian; born April 14, 1942, Moscow; married, one child. **Spaceflights: Soyuz 13, Soyuz T-5/T-7**

Graduated from the Moscow Aviation Institute (1966), worked as an engineer in a design bureau, and joined the cosmonaut corps in 1972. He was the flight engineer on Soyuz 13, and was a prime crew member for Soyuz 35 until he sustained a knee injury and was replaced by Ryumin. He was the flight engineer on Soyuz T-5/Salyut 7/Soyuz T-7.

Aleksei Arkhipovich Leonov; Major General, Soviet Air Force; born May 30, 1934, Listvayanka, Altay region; married, two children. **Spaceflights: Voskhod 2, Soyuz 19 (Apollo-Soyuz Test Project)**

Graduated from Chuguyev Air Force School, the Zhukovskiy Air Force Engineering Academy, and joined the cosmonaut corps in 1960. He was the co-pilot of Voskhod 2 (first man to perform extravehicular activity); was on the backup crews for Soyuz 10 and Soyuz 11; and was the command pilot for Soyuz 19 (the Apollo-Soyuz Test Project). Leonov resigned from the cosmonaut corps in 1975, and is currently a Deputy Director of the Gagarin Cosmonaut Training Center and an internationally known space artist.

NO PHOTOGRAPH AVAILABLE

Anatoliy Semenovich Levchenko; civilian; born May 21, 1941 in Krasnokutsk, Kharkov region; died August 6, 1988 of a brain tumor; was married, one child. **Spaceflight: Soyuz TM-4/TM-3**

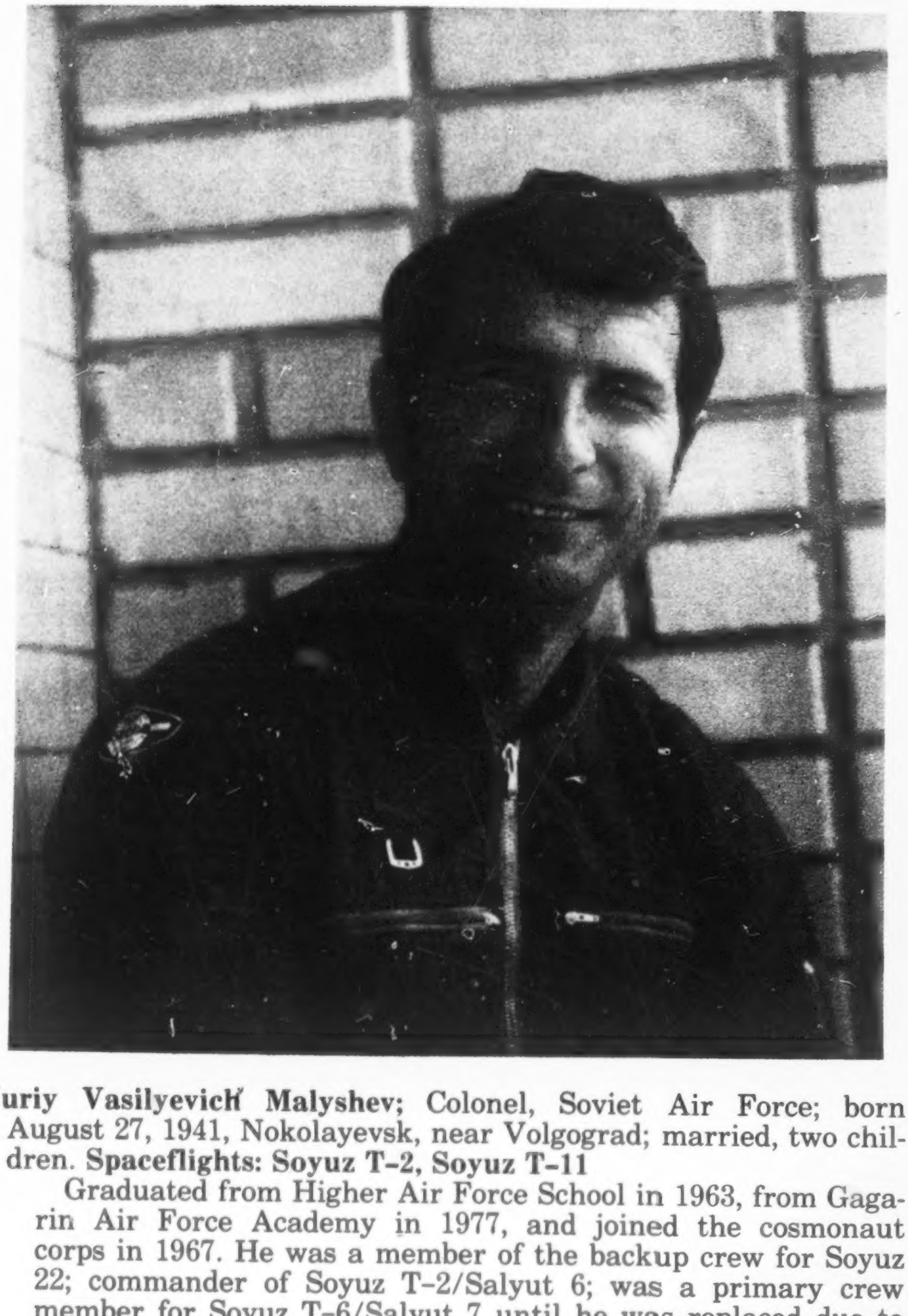
Graduated from the Higher Military Aviation School for Pilots at Chernigov in 1964, then served in combat units in the Air Force. Graduated from test pilot school in 1971. He qualified as Test Pilot First Class and also received the title Meritorious Test Pilot. He began training as a cosmonaut in 1978, and was chosen as a member of the cosmonaut group training to fly the Soviet space shuttle. He flew as a cosmonaut-researcher on the Soyuz TM-4/Mir/Soyuz TM-3 mission as part of that training.

Vladimir Afanasevich Lyakhov; Colonel, Soviet Air Force; born July 20, 1941, Antratsit, Voroshilovgrad region; married, two children. **Spaceflights: Soyuz 32/34, Soyuz T-9, Soyuz TM-6/ TM-5**

Graduated from the Gritsevets Higher Military Aviation School for Pilots at Kharkov in 1964, and served in the Air Force. He joined the cosmonaut corps in 1967, and graduated from the Gagarin Military Aviation Academy in 1975. He was on the backup crew for Soyuz 29; served as commander of Soyuz 32/Salyut 6/Soyuz 34; was on the backup crews for Soyuz 39 and Soyuz T-8; was commander of Soyuz T-9/Salyut 7; was backup commander for Soyuz TM-5; and commanded the Soyuz TM-6/Mir/Soyuz TM-5 mission.

Oleg Grigoriyevich Makarov; civilian; born January 6, 1933, Kalinin region near Moscow; married, two children. **Spaceflights: Soyuz 12, Soyuz 18A, Soyuz 27, Soyuz T-3**

Graduated with an engineering degree from Moscow's Higher Technical School (1957), joined a design bureau where he took part in developing the Voskhod and Soyuz ships, and joined the cosmonaut corps in 1966. He was the flight engineer for Soyuz 12; on the backup crew for Soyuz 17; was flight engineer on Soyuz 18A (the "April 5th Anomaly") and Soyuz 27/Salyut 6; on the backup crew for Soyuz T-2; and flight engineer on Soyuz T-3/Salyut 6. He resigned from the cosmonaut corp in 1981 and is now working in a design bureau.



Yuriy Vasilyevich Malyshev; Colonel, Soviet Air Force; born August 27, 1941, Nokolayevsk, near Volgograd; married, two children. **Spaceflights: Soyuz T-2, Soyuz T-11**

Graduated from Higher Air Force School in 1963, from Gagarin Air Force Academy in 1977, and joined the cosmonaut corps in 1967. He was a member of the backup crew for Soyuz 22; commander of Soyuz T-2/Salyut 6; was a primary crew member for Soyuz T-6/Salyut 7 until he was replaced due to illness; and was commander of Soyuz T-11/Salyut 7. He is currently the deputy commander of the cosmonaut group.

Musa Khiramanovich Manarov (bottom middle); civilian; born March 22, 1951, in Baku; married, two children. **Spaceflight: Soyuz TM-4/TM-6**

Graduated from the Sergo Ordzhonikidze Aviation Institute in Moscow in 1974, and worked in a design bureau on the development and testing of space flight equipment. He entered cosmonaut training in 1978, and was flight engineer on the Soyuz TM-4/Mir/TM-6 mission.

Andriyan Grigoriyevich Nikolayev; Major General, Soviet Air Force; born September 5, 1929, Shorshely, Chuvash Autonomous Republic; unmarried, one child (by a previous marriage). **Spaceflights: Vostok 3, Soyuz 9**

Graduated as a pilot from an Air Force School (1954), joined the cosmonaut corps in 1960, and graduated from Zhukovskiy Air Force Engineering Academy in 1968. He was backup pilot for Vostok 2; pilot of Vostok 3; backup commander for Soyuz 8; and commander of Soyuz 9. Nikolayev retired as a cosmonaut in 1970 and is now First Deputy Director of the Gagarin Cosmonaut Training Center.

Viktor Ivanovich Patsayev; civilian; born June 19, 1933, Aktybinsk, Kazakhstan; died June 29, 1971, during Soyuz 11 reentry; was married, two children. **Spaceflight: Soyuz 11**

Graduated from the Penzensk Industrial Institute (1955), joined the cosmonaut corps in 1969, and earned a master of science degree (1971). He was the test engineer on Soyuz 11/ Salyut 1.

NO PHOTOGRAPH AVAILABLE

Valeriy Vladimirovich Polyakov; civilian; born April 27, 1942, Tula. **Spaceflight: Soyuz TM-6/TM-7**

Graduated from the First Sechenov Medical Institute in Moscow in 1965, then worked in various scientific research institutes and organizations. He distinguished himself in space medicine and also worked on the health safety aspects of the Soyuz and Salyut flight crews. He is a candidate of medical sciences and worked in the Medico-Biological Institute of the USSR Ministry of Health Protection. He started cosmonaut training as a physician-researcher in 1972. He was a member of the backup crews for Soyuz T-3 and T-10, and was the physician on Soyuz TM-6/Mir/Soyuz TM-7. He is now commander of the physician cosmonaut group.

Leonid Ivanovich Popov; Colonel, Soviet Air Force; born August 31, 1945, Aleksandriya, Kirovogard Region, Ukraine; married, two children. **Spaceflights: Soyuz 35/37, Soyuz 40, Soyuz T-7/T-5**

Graduated from Gagarin Air Force Academy, attended Air Force College in Chernigov, and joined the cosmonaut corps in 1970. He was on the backup crews for Soyuz 22 and Soyuz 32; was commander of Soyuz 35/Salyut 6/Soyuz 37, Soyuz 40/Salyut 6, and Soyuz T-7/Salyut 7/Soyuz T-5; and was on the backup crew for Soyuz T-13. He resigned from the cosmonaut corps in 1985 and returned to active duty in the Soviet Air Force.

Pavel Romanovich Popovich; Major General, Soviet Air Force; born October 5, 1930, Uzin, Kiev region; married, two children.
Spaceflights: Vostok 4, Soyuz 14

Graduated from an industrial technicum (1951), a military aviation school (1954), Zhukovskiy Air Force Engineering Academy (1968), and joined the cosmonaut corps in 1960. He was the pilot of Vostok 4 and command pilot of Soyuz 14/Salyut 3. He stepped down as a cosmonaut in 1976 and was a deputy director at the Gagarin Cosmonaut Training Center until he retired in 1988. General Popovich has written an autobiographical work entitled *Takeoff in the Morning.*

Yuriy Viktorovich Romanenko; Colonel, Soviet Air Force; born August 1, 1944, village of Koltubanovskiy, Buzuluk district, Orenburg region; married, two children. **Spaceflights: Soyuz 26, Soyuz 38, Soyuz TM-2/TM-3**

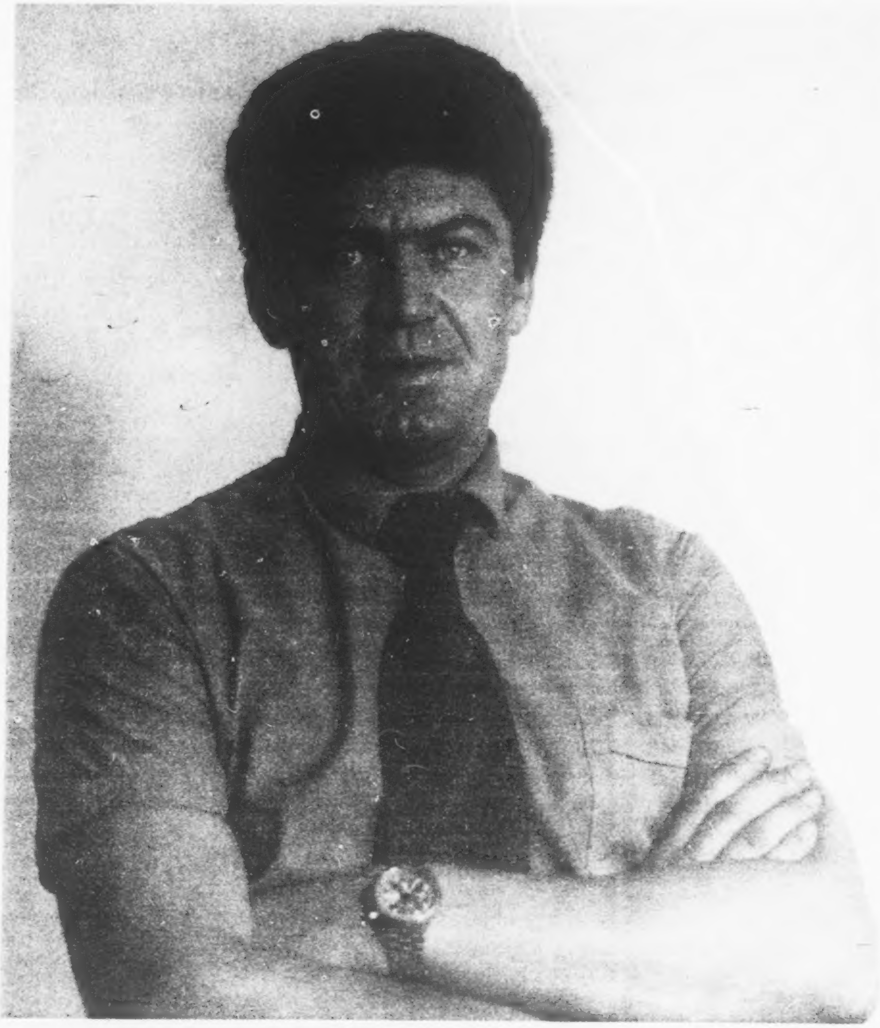
Graduated from the Leninskiy Komsomol Higher Military Aviation School for Pilots at Chernigov in 1966 and served as an Air Force flight instructor. He joined the cosmonaut corps in 1970, and graduated from the Gagarin Military Aviation Academy in 1981. He was on the backup crews for Soyuz 19 (the Apollo-Soyuz Test Project) and Soyuz 25; was commander of Soyuz 26/Salyut 6; backup commander for Soyuz 33; commander of Soyuz 38/Salyut 6; backup commander for Soyuz 40; and commander of Soyuz TM-2/Mir/Soyuz TM-3. He resigned from the cosmonaut corps in 1988 and is now working at the Gagarin Cosmonaut Training Center.

Valeriy Il'ÿich Rozhdestvenskiy; Colonel Engineer, Soviet Air Force; born February 13, 1939, Leningrad; married, one child.
Spaceflight: Soyuz 23

Graduated with a degree in naval engineering from Dzerzhinsky Higher School (1961), commanded a unit of Baltic Fleet rescue divers, and joined the cosmonaut corps in 1965. He was on the backup crews for Soyuz 14, Soyuz 15 and Soyuz 21, and flew in space as flight engineer for Soyuz 23/Salyut 5. He resigned as a cosmonaut in 1977, and now works as a division head at the Gagarin Cosmonaut Training Center.

Nikolay Nikolayevich Rukavishnikov; civilian; born September 18, 1932, Tomsk, Siberia; married, one child. **Spaceflights: Soyuz 10, Soyuz 16, Soyuz 33**

Graduated from the Moscow Engineering and Physics Institute (1957), and joined the cosmonaut corps in 1967. He was the test engineer for Soyuz 10; flight engineer for Soyuz 16; was on the backup crews for Soyuz 19 (the Apollo-Soyuz Test Project) and Soyuz 28; and was commander of Soyuz 33. He was a member of the crew for Soyuz T-11 until he was replaced due to illness. He resigned from the cosmonaut corps in 1984 and is currently head of the Federation of Cosmonautics.



Valeriy Viktorovich Ryumin; civilian; born August 16, 1939, Komsomolsk-on-Amur, Siberia; married, two children. **Spaceflights: Soyuz 25, Soyuz 32/34, Soyuz 35/37**

Graduated from a technicum, served with the Army, graduated from the Moscow forestry school's Department of Electronics, worked in a design bureau developing new models of space equipment, and participated in controlling space flights. He joined the cosmonaut corps in 1973 and was flight engineer for Soyuz 25/Salyut 6; backup flight engineer for Soyuz 29; and flight engineer for Soyuz 32/Salyut 6/Soyuz 34, and Soyuz 35/Salyut 6/Soyuz 37 (replacing Lebedev). He retired from the cosmonaut corps in 1981 and is now the flight director for the Mir space station and Buran space shuttle programs.

Gennadi Vasiliyevich Sarafanov; Colonel, Soviet Air Force, born January 1, 1942, near Saratov; married, two children. **Spaceflight: Soyuz 15**

Graduated from Balashov Higher Air Force Flying School, served in various air units, and joined the cosmonaut corps in 1965. He was on the backup crew for Soyuz 14, and was commander of Soyuz 15/Salyut 3. He stepped down as a cosmonaut in 1980 and is now retired from the Soviet Air Force and working at the Znanie publishing house.

Viktor Petrovich Savinykh; civilian; born March 7, 1940, village of Berezkiny, Orichev district, Kirov region; married, one child. **Spaceflights: Soyuz T-4, Soyuz T-13, Soyuz TM-5/TM-4**

Graduated from the Rail Transportation Technical College at Perm in 1960, served in the Soviet Army, and graduated from the Institute for Geodetic Engineering, Aerial Photography, and Cartography in Moscow in 1969. He worked in a design bureau and specialized in designing instruments for space flight applications. He joined the cosmonaut corps in 1978 and flew as flight engineer on Soyuz T-4/Salyut 6, Soyuz T-13/Salyut 7, and Soyuz TM-5/Mir/Soyuz TM-4. (He served on 6 backup crews: Soyuz T-3, Soyuz T-7, Soyuz T-8, Soyuz T-10, Soyuz T-12 and Soyuz TM-3.) He resigned from the cosmonaut corps in 1988 to become Rector of the Moscow Institute of Geodetic Engineering, Aerial Photography and Cartography.

Svetlana Yevgenevna Savitskaya; civilian; born August 8, 1948, Moscow; married, one child. **Spaceflights: Soyuz T-7/T-5, Soyuz T-12**

A parachutist and pilot as a teenager, setting records in both, she graduated from the Central Flight Mechanics School of DOSAAF and the Sergo Ordzhonikidze Aviation Institute in Moscow. She then worked as flight instructor and later was a test pilot. She worked in a design bureau testing space flight instruments and joined the cosmonaut corps in 1980. She was a cosmonaut-researcher on the Soyuz T-7/Salyut 7/Soyuz T-5 mission, and flight engineer on the Soyuz T-12/Salyut 7 mission becoming the first woman to make a spacewalk.

NO PHOTOGRAPH AVAILABLE

Aleksandr Aleksandrovich Serebrov; civilian; born February 15, 1944, Moscow; married, two children. **Spaceflights: Soyuz T-7/T-5, Soyuz T-8**

Graduated from the Moscow Institute of Physical Engineering in 1967, worked as researcher at the Institute, and at a design bureau developing and testing spacecraft. He joined the cosmonaut corps in 1978 and was flight engineer on Soyuz T-7/Salyut 7/Soyuz T-5, a research engineer on Soyuz T-8, and a backup flight engineer for Soyuz TM-2, Soyuz TM-5, and Soyuz TM-7. He is now training for the next mission to Mir (Soyuz TM-8).

Vitaliy Ivanovich Sevast'yanov; civilian; born July 8, 1935, Krasnouralsk, Sverdlovsk region; married, one child. **Spaceflights: Soyuz 9, Soyuz 18**

Graduated from the Moscow Aviation Institute (1959), earned a master of science degree in engineering from the Institute (1965), and joined the cosmonaut corps in 1967. He was on the backup crew for Soyuz 8, and was the flight engineer on Soyuz 9 and Soyuz 18/Salyut 4. He is still a member of the cosmonaut corps and also works as a journalist.

Vladimir Aleksandrovich Shatalov; Lieutenant General, Soviet Air Force; born December 8, 1927, Petropavlovsk, Kazakhstan; married, two children. **Spaceflights: Soyuz 4, Soyuz 8, Soyuz 10**

Graduated from the Kachinsk Air Force College (1949), enrolled in the Air Force Academy in Moscow in 1953, and joined the cosmonaut corps in 1963. He was the backup pilot of Soyuz 3; command pilot of Soyuz 4; backup pilot for Soyuz 6 and Soyuz 7; command pilot of Soyuz 8; and command pilot of Soyuz 10/Salyut 1. General Shatalov is currently the Commander of the Gagarin Cosmonaut Training Center. He is the author and co-author of several books about space flight and cosmonauts.

NO PHOTOGRAPH AVAILABLE

Aleksandr Vladimirovich Shchukin; civilian; born January 19, 1946 in Vienna, Austria; died August 18, 1988 in an experimental airplane crash; was married.

Graduated from the Higher Military Aviation School for pilots and then served as a test pilot. Shchukin joined the cosmonaut corps in 1982 and was training as a pilot for the Soviet space shuttle at the time of his death. He was also the back-up cosmonaut-researcher for the Soyuz TM–4/TM–3 mission.

Georgiy Stepanovich Shonin; Lieutenant General, Soviet Air Force; born August 3, 1935, Rovenki, the Ukraine; married, two children. **Spaceflight: Soyuz 6**

Attended Naval Air Force College, Zhukovskiy Air Force Engineering Academy, and joined the cosmonaut corps in 1960. He was backup command pilot for Soyuz 4, and command pilot of Soyuz 6. He has written a book, *The Very First Ones,* published in 1977. Shonin resigned from the cosmonaut corps in 1976 and returned to duty in the Soviet Air Force.

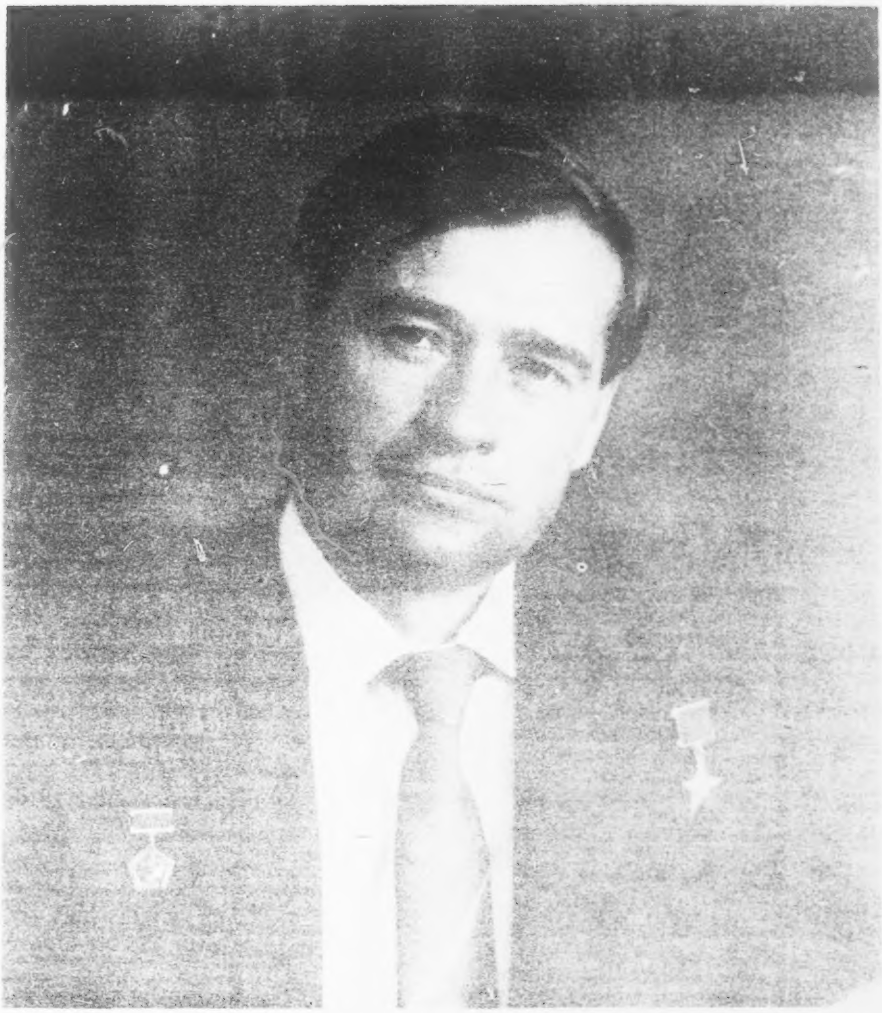
NO PHOTOGRAPH AVAILABLE

Anatoliy Yakovlevich Solovyev; Colonel, Soviet Air Force; born January 16, 1948, Riga. **Spaceflight: Soyuz TM-5/TM-4**

He started working at age sixteen as a metal worker and he also studied at a school for working youths. In 1968, he entered the Lenin Komsomol Higher Military Aviation School for Pilots at Chernigov. He graduated in 1972, then served in the Air Force. He joined the cosmonaut corps in 1976 and completed test pilot training in 1977. He served as backup commander for Soyuz TM-3, and commander of the Soyuz TM-5/Mir/Soyuz TM-4 mission. He is currently deputy flight director for Mir.

Vladimir Alekseyevich Solovyev; civilian; born November 11, 1946, Moscow; married, two children. **Spaceflights: Soyuz T-10, Soyuz T-15**

Graduated from Bauman Higher Technical School in Moscow in 1970, and worked in a design bureau, where he participated in the development of new space flight equipment. He joined the cosmonaut corps in 1978, and served as backup flight engineer for Soyuz T-6, flight engineer for the Soyuz T-10/Salyut 7 mission, and for the Soyuz T-15/Mir/Salyut 7 mission, ferrying between the two space stations. He resigned from the cosmonaut corps in 1986.



Gennadi Mikhaylovich Strekalov; civilian; born October 28, 1940, Mytishchi, Moscow Region; married, two children. **Spaceflights: Soyuz T-3, Soyuz T-8, Soyuz T-11**

Graduated from the Bauman Higher Technical School in Moscow, and worked in the design bureau that has produced most of the Soviet cosmonaut-engineers, and joined the cosmonaut corps in 1973. He was research engineer for Soyuz T-3/Salyut 6, and flight engineer on Soyuz T-8/Salyut 7. Strekalov replaced Rukavishnikov to become a crew member on the aborted flight of Soyuz T-10 (designated in the West as Soyuz T-10A). He later flew on Soyuz T-11/Salyut 7. (He has been on 4 backup crews: Soyuz 22, Soyuz T-5, Soyuz T-9, and Soyuz T-14.)

Valentina Vladimirovna Nikolayeva-Tereshkova; Honorary Colonel Engineer, Soviet Air Force; born March 6, 1937, Maslennikovo, Yaroslav region; unmarried, one child (by a previous marriage). **Spaceflight: Vostok 6**

Graduated from a textile technical school and joined the cosmonaut corps in 1962. She was the pilot of Vostok 6, becoming the first woman to fly in space, and left the program after her space flight in 1963. She graduated from the Zhukovskiy Air Force Engineering Academy. Currently, she is a member of the Central Committee of the Communist Party of the Soviet Union and Chairwoman of the Soviet Friendship Society.

German Stepanovich Titov; Colonel General, Soviet Air Force; born September 11, 1935, Verkhneye Zhilino, Kosikha district, Altay region; married, two children. **Spaceflight: Vostok 2**

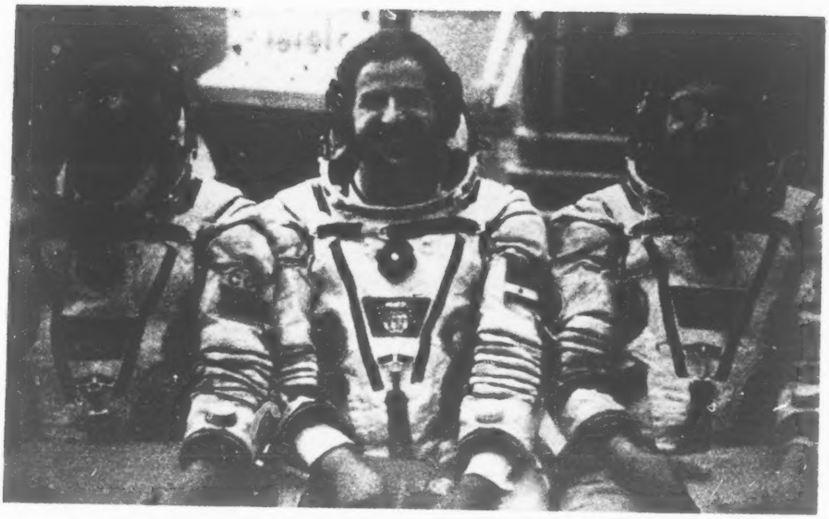
Graduated from Volgograd Military Aviation College (1957) and joined the cosmonaut corps in 1960. He was the backup pilot for Vostok 1 and pilot for Vostok 2. In 1968, Titov graduated from the Zhukovskiy Air Force Engineering Academy. He left the cosmonaut corps in 1971 and is now the coordinator of launch vehicle manufacturing for the Ministry of Defense.

Vladimir Georgiyevich Titov (on left); Colonel, Soviet Air Force; born January 1, 1947, Svetinsk, Chita region; married. **Spaceflights: Soyuz T-8, Soyuz TM-4/TM-6**

Graduated from the Lenin Komsomol Higher Military Aviation School for Pilots in Chernigov in 1970, and served as flight instructor and flight commander in the Air Force. He joined the cosmonaut corps in 1976 and was on the backup crew for Soyuz T-5; was commander of Soyuz T-8; was a member of the backup crew for Soyuz T-9; was commander of the aborted Soyuz T-10A mission; backup commander for Soyuz TM-2; and commander of Soyuz TM-4/Mir/Soyuz TM-6. He graduated from the Gagarin Military Aviation Academy in 1987.

Vladimir Vladimirovich Vasyutin (left); Colonel, Soviet Air Force; born March 8, 1952, Kharkov; married, two children. **Spaceflight: Soyuz T-14**

Graduated from the Gritsevets Higher Military Aviation School for Pilots at Kharkov and served in the Air Force as a flight instructor. He joined the cosmonaut corps in 1976, and graduated from test pilot school in 1977. He was on the backup crews for Soyuz T-7, Soyuz T-10 and Soyuz T-12, and was commander of the Soyuz T-14/Salyut 7/Soyuz T-13 mission. He became ill during the mission and it had to be terminated early. Vasyutin left the cosmonaut corps in 1986 and is now at the Soviet Air Force Academy.



Aleksandr Stepanovich Viktorenko (on left); Colonel, Soviet Air Force, born March 29, 1947, village of Olginka, Sergeyevskiy district, Northern Kazakhstan region; married, two children. **Spaceflight: Soyuz TM-3/TM-2**

Graduated from the Polbin Higher Military Aviation School for Pilots in Orenburg in 1969, then served in the Air Force. He joined the cosmonaut corps in 1978. He served as backup commander for Soyuz T-14 and T-15; flew as commander of the Soyuz TM-3/Mir/Soyuz TM-2 mission; and was backup commander for Soyuz TM-7. He is now in training for the next mission to Mir (Soyuz T-8).

NO PHOTOGRAPH AVAILABLE

Igor Petrovich Volk; civilian; born April 12, 1937, Gotvald, Kharkov region; married, one child. **Spaceflight: Soyuz T–12**

Graduated from the Military Aviation School for Pilots at Kirovograd in 1956, then served in the Air Force. Graduated from test pilot school in 1965 and has been awarded the title Meritorious Test Pilot. In 1969, he completed studies at the Sergo Ordzhonikidze Aviation Institute in Moscow. He began cosmonaut training in 1978 and served as cosmonaut-researcher on the Soyuz T–12/Salyut 7 mission. Volk is now training as a space shuttle pilot and is the commander of the shuttle pilot group.

NO PHOTOGRAPH AVAILABLE

Aleksandr Aleksandrovich Volkov; Colonel, Soviet Air Force; born May 27, 1948, Gorlovka, Donetsk region; married, two children.
Spaceflights: Soyuz T-14/T-13, Soyuz TM-7

Graduated from the Gritsevets Higher Military Aviation School for Pilots at Kharkov in 1970 and served in the Air Force as flight instructor. He joined the cosmonaut corps in 1976, and served as cosmonaut-researcher on the Soyuz T-14/Salyut 7/Soyuz T-13 mission, was backup commander for Soyuz TM-4, and commanded the Soyuz TM-7/Mir flight.

Vladislav Nikolayevich Volkov; civilian; born November 23, 1935, Moscow; died June 29, 1971, during Soyuz 11 reentry; was married, one child. **Spaceflight: Soyuz 7, Soyuz 11**

Entered Moscow Aviation Institute in 1953, worked as an engineer, and joined the cosmonaut corps in 1966. He was the flight engineer on Soyuz 7 and Soyuz 11/Salyut 1. His autobiography, *We're Stepping into the Sky,* was published posthumously.

Boris Valentinovich Volynov; Colonel, Soviet Air Force; born December 18, 1934, Irkutsk, Siberia; married, two children. **Spaceflight: Soyuz 5, Soyuz 21**

Attended Zhukovskiy Air Force Engineering Academy and joined the cosmonaut corps in 1960. He was the command pilot for Soyuz 5 and Soyuz 21/Salyut 5. (He served on 7 backup crews: Vostok 3, Vostok 4, Vostok 5, Voskhod 1, Soyuz 3, Soyuz 14 and Soyuz 15.) He retired in 1982 and is currently commander of the cosmonaut detachment.

Boris Borisovich Yegorov; civilian, born November 26, 1937, Moscow; married, one child. **Spaceflight: Voskhod 1**

Graduated from the First Medical Institute in 1961, joined the cosmonaut corps in 1964, received a Doctor of Medicine degree from the Humboldt University of Berlin (1965), and became a candidate of medical sciences in 1967. He was the physician on Voskhod 1, and gave up his temporary role as a cosmonaut to return to medicine shortly after his space flight. Yegorov is currently head of a medical laboratory.

Aleksei Stanislavovich Yeliseyev; civilian; born July 13, 1934, Zhizdra; married, one child. **Spaceflights: Soyuz 4/5, Soyuz 8, Soyuz 10**

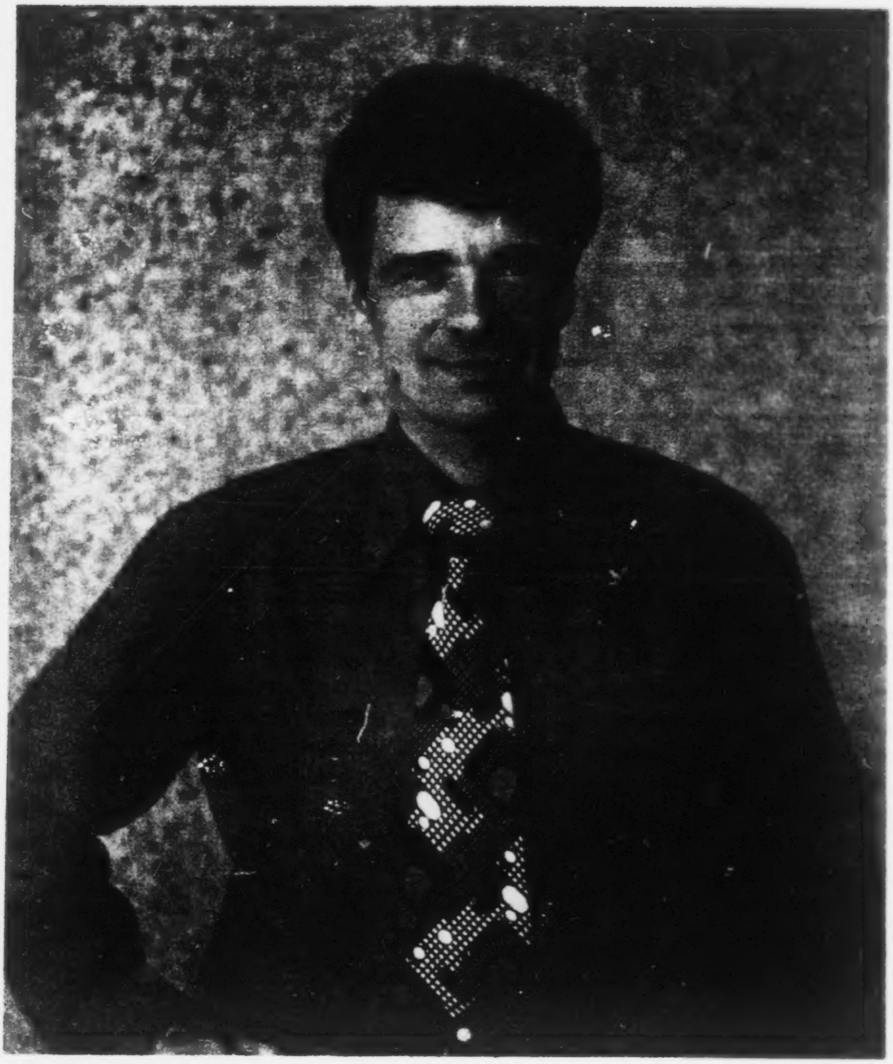
Attended Bauman Technical Higher School in Moscow, received master of technical science degree in engineering. He joined the cosmonaut corps in 1966 and was the technical scientist for Soyuz 4 and 5, transferring in flight from Soyuz 5 to Soyuz 4; was on the backup crews for Soyuz 6 and Soyuz 7; and was technical scientist for Soyuz 8, and Soyuz 10. He was the Soviet flight director for the Apollo-Soyuz Test Project, and flight director for Salyut 6. Yeliseyev has also earned a doctorate in technical sciences. He is the author of several books dealing with space flight and space technology. Currently, he is a Rector at the Bauman Higher Technical School.

NO PHOTOGRAPH AVAILABLE

Andrei Yevgenevich Zaitsev; civilian; born August 5, 1957 in Tula. Graduated from Bauman Higher Technical School and joined the cosmonaut corps in 1987. He was the backup crew flight engineer for Soyuz TM-5. Shortly thereafter, he was declared medically unfit for mission assignment; he remains an active cosmonaut.

Vitaliy Mikhaylovich Zholobov; Colonel Engineer, Soviet Air Force; born June 18, 1937, Zburyevka, Ukraine; married, one child. **Spaceflight: Soyuz 21**

Graduated from the Azerbayzhan Oil and Chemistry Institute with a degree in chemistry (1959), joined the Army as a test engineer, and joined the cosmonaut corps in 1963. He was backup flight engineer for Salyut 3 (for both Soyuz 14 and Soyuz 15) and flight engineer for Soyuz 21/Salyut 5. He left the cosmonaut corps in 1981 and is now retired from the Soviet Air Force.



Vyacheslav Dmitriyevich Zudov: Colonel, Soviet Air Force, born January 8, 1942, Bor; married, two children. **Spaceflight: Soyuz 23**

Graduated from Balashov Air Force School (1963), became a transport pilot, and joined the cosmonaut corps in 1965. Zudov is a graduate of the Gagarin Air Force Academy. He was command pilot of Soyuz 23/Salyut 5. (He served on 5 backup crews: Soyuz 14, Soyuz 15, Soyuz 21, Soyuz 35, and Soyuz T-4.) He resigned from the cosmonaut corps and now works at the Gagarin Cosmonaut Training Center as a division head.

TABLE 4–2.—SUMMARY OF SOVIET COSMONAUTS

Name	Year chosen	Service/rank	Flight(s)	Comments
Aksenov	1973	civilian	Soyuz 22 Soyuz T–2	Working in research institute.
Aleksandrov, A.	1978	civilian	Soyuz T–9 Soyuz TM–3	Active cosmonaut.
Alekseyev*	1967	AF/Colonel	none	Working with the Administrative Head Engineer Group, Gagarin Cosmonaut Training Center.
Andreyev	1970	civilian	none	Resigned.
Anikeyev*	1960	AF	none	Retired from Soviet Air Force.
Anokhin*	1966	AF/Colonel Eng.	none	Died in April 1986.
Artyukhin	1963	AF/Colonel Eng.	Soyuz 14	Retired from Soviet Air Force.
Arzamazov*	1976	civilian	pending	Active cosmonaut; medical researcher.
Atkov	1977	civilian	Soyuz T–10	Resigned. Head of the All Union Cardiology Research Center.
Bacharin*	?	AF	pending	Active cosmonaut.
Balandin*	1978	civilian	pending	Training for upcoming mission.
Bel'yayev	1950	AF/Colonel	Voskhod 2	Died of complications following surgery in 1970.
Beregovoy	1964	AF/Lt. General	Soyuz 3	Was commander of the Gagarin Cosmonaut Training Center from 1972–1987. Now retired.
Berezovoy	1970	AF/Colonel	Soyuz T–5/Soyuz T–7	Active cosmonaut.
Bondarenko*	1960	AF/Sr. Lieutenant	none	Died in March 1961.
Boroday*	?	AF	pending	Active cosmonaut.
Buinovskiy*	1963	AF	none	Retired.
Bykovskiy	1960	AF/Colonel	Vostok 5 Soyuz 22 Soyuz 31/Soyuz 29	Head of Soviet Scientific and Cultural Center in East Berlin.
Demin	1963	AF/Colonel Eng.	Soyuz 15	Retired.
Dobrokvashina*	?	civilian	pending	Active cosmonaut.
Dobrovolskiy	1963	AF/Lt. Colonel	Soyuz 11	Killed during the reentry of Soyuz 11.
Dzhanibekov	1970	AF/Major General	Soyuz 27 Soyuz 39 Soyuz T–6 Soyuz T–12 Soyuz T–13	Division Head, Gagarin Cosmonaut Training Center.
Feoktistov	1964	civilian	Voskhod 1	Professor of design.
Filatyev*	1960	AF	none	Retired from Soviet Air Force.
Filipchenko	1963	AF/Major General	Soyuz 7 Soyuz 16	Retired.
Gagarin	1960	AF/Colonel	Vostok 1	First man in space. Killed in crash of jet trainer in 1968.
Glazkov	1965	AF/Colonel Eng.	Soyuz 24	Deputy Director, Gagarin Cosmonaut Training Center.
Golovanov*	1965	civilian	none	Writer and journalist.
Gorbatko	1960	AF/Major General	Soyuz 7 Soyuz 24 Soyuz 37/Soyuz 36	Faculty head, Zhukovskiy Air Force Engineering Academy.
Grechko	1966	civilian	Soyuz 17 Soyuz 26 Soyuz T–14/Soyuz T–13	Vice Chairman, Soviet Committee for Defending Peace, and lab specialist in astrophysics.
Grekov*	1978	AF	pending	Active cosmonaut.
Gubarev	1963	AF/Major General	Soyuz 17 Soyuz 28	Returned to active duty, Soviet Air Force.
Gulyayev*	1963	AF	none	Resigned.
Ilarionov	1970	AF/Colonel Eng.	pending	Active cosmonaut.
Ilyin*	1965	civilian	none	Working as a scientist at the Institute of Biological Problems.

TABLE 4-2.—SUMMARY OF SOVIET COSMONAUTS—Continued

Name	Year chosen	Service/rank	Flight(s)	Comments:
Isaulov*	1970	AF	pending	Active cosmonaut.
Ivanchenkov	1970	civilian	Soyuz 29/Soyuz 31 Soyuz T-6	Active cosmonaut.
Ivanova*	1980	civilian	pending	Active cosmonaut.
Kaleri	1987	civilian	pending	Active cosmonaut; uncertain flight status due to medical problems.
Kartashov*	1960	AF	none	Retired from Soviet Air Force.
Katys*	1964	civilian	none	Professor, Soviet Academy of Sciences.
Khrunov	1960	AF/Colonel	Soyuz 4/Soyuz 5	Returned to active duty, Soviet Air Force.
Kisilev*	1965	civilian	none	Working as a scientist at the Institute of Biological Problems.
Kizim	1965	AF/Colonel	Soyuz T-3 Soyuz T-10 Soyuz T-15	Resigned. Teaching at Air Force Academy.
Klimuk	1965	AF/Major General	Soyuz 13 Soyuz 18 Soyuz 30	Deputy Director, Gagarin Cosmonaut Training Center (Political Affairs).
Kolodin*	1963	AF/Colonel	none	Working at Soviet Flight Control Center.
Komarov	1960	AF/Colonel Eng.	Voskhod 1 Soyuz 1	Killed upon impact with Earth when Soyuz 1 parachute lines tangled during descent.
Kononenko*	1978	civilian	none	Died in 1978.
Kovalenok	1967	AF/Major General	Soyuz 25 Soyuz 29/Soyuz 31 Soyuz T-4	Returned to active duty, Soviet Air Force.
Kozelskiy*	1967	AF	pending	Active cosmonaut.
Krikalev	1985	civilian	Soyuz TM-7	Active cosmonaut.
Kubasov	1966	civilian	Soyuz 6 Soyuz 19 (Apollo-Soyuz) Soyuz 36/Soyuz 35	Resigned.
Kugno*	1963	AF	none	Resigned.
Kuklin*	1963	AF	none	Resigned.
Kuznetsova*	1962	AF/Hon. Col. Eng.	none	Cosmonaut instructor.
Laveikin	1978	civilian	Soyuz TM-2/Soyuz TM-3	Active cosmonaut.
Lazarev	1964	AF/Colonel	Soyuz 12 Soyuz 18A [1]	Retired from the Soviet Air Force.
Lebedev	1972	civilian	Soyuz 13 Soyuz T-5/Soyuz T-7	Active cosmonaut.
Leonov	1960	AF/Major General	Voskhod 2 Soyuz 19 (Apollo-Soyuz)	First man to perform extravehicular activity. Now Deputy Director of Gagarin Cosmonaut Training Center.
Letunov*	1965	civilian	none	Died in 1983.
Levchenko	1978	civilian	Soyuz TM-4/Soyuz TM-3	Died of a brain tumor in August 1988. Was in training as shuttle pilot.
Lisun*	1965	AF	pending	Active cosmonaut.
Lyakhov	1967	AF/Colonel	Soyuz 32/Soyuz 34 Soyuz T-9 Soyuz TM-6/Soyuz TM-5	Active cosmonaut.
Makarov	1966	civilian	Soyuz 12 Soyuz 18A [1] Soyuz 27 Soyuz T-3	Resigned from cosmonaut corps in 1981; working in a design bureau.
Makrushin*	1972	civilian	pending	Active cosmonaut.

TABLE 4–2.—SUMMARY OF SOVIET COSMONAUTS—Continued

Name	Year chosen	Service/rank	Flight(s)	Comments
Malyshev	1967	AF/Colonel	Soyuz T–2 Soyuz T–11	Active cosmonaut. Deputy Commander of cosmonaut group.
Manarov	1978	civilian	Soyuz TM–4/Soyuz TM–6	Active cosmonaut.
Matinchenko*	1963	AF	none	Resigned.
Nelyubov*	1960	AF	none	Deceased.
Nikolayev	1960	AF/Major General	Vostok 3 Soyuz 9	First Deputy Director, Gagarin Cosmonaut Training Center.
Patsayev	1969	civilian	Soyuz 11	Killed during reentry of Soyuz 11.
Polyakov	1972	civilian	Soyuz TM–6/Soyuz TM–7	Active cosmonaut.
Ponomaryov*	1970	civilian	none	Works in a research institute on rocket technologies.
Ponomaryova*	1962	AF/Hon. Col. Eng.	none	Workout instructor at Gagarin Cosmonaut Training Center.
Popov	1970	AF/Colonel	Soyuz 35/Soyuz 37 Soyuz 40 Soyuz T–7/Soyuz T–5	Returned to active duty, Soviet Air Force.
Popovich	1960	AF/Major General	Vostok 4 Soyuz 14	Retired.
Preobrazhenskiy*	1965	AF	none	Resigned.
Pronina*	1980	civilian	pending	Active cosmonaut.
Rafikov*	1960	AF	none	Resigned.
Romanenko	1970	AF/Colonel	Soyuz 26 Soyuz 38 Soyuz TM–2/Soyuz TM–3	Resigned in 1988; now working at the Gagarin Cosmonaut Training Center.
Rozhdestvenskiy	1965	AF/Colonel Eng.	Soyuz 23	Resigned from cosmonaut corps in 1977; working at Gagarin Cosmonaut Training Center.
Rukavishnikov	1967	civilian	Soyuz 10 Soyuz 16 Soyuz 33	Resigned. Head of Cosmonautics Federation.
Ryumin	1973	civilian	Soyuz 25 Soyuz 32/Soyuz 34 Soyuz 35/Soyuz 37	Resigned. Flight Director for the Mir space station and Buran (the Soviet space shuttle).
Salei*	1976	AF	none	Retired from cosmonaut corps in 1987.
Sarafanov	1965	AF/Colonel	Soyuz 15	Retired. Working at the Znanie publishing house.
Savinykh	1978	civilian	Soyuz T–4 Soyuz T–13 Soyuz TM–5/Soyuz TM–4	Rector, Moscow Institute of Geodetic Engineering, Aerial Photography and Cartography.
Savitskaya	1980	civilian	Soyuz T–7/Soyuz T–5 Soyuz T–12	First woman to make a spacewalk.
Senkevich*	1965	civilian	none	Working as a scientist at the Institute of Biological Problems.
Serebrov	1978	civilian	Soyuz T–7/Soyuz T–5 Soyuz T–8	Training for next mission to Mir (Soyuz TM–8).
Sevast'yanov	1967	civilian	Soyuz 9 Soyuz 18	Active cosmonaut.
Shatalov	1963	AF/Lt. General	Soyuz 4 Soyuz 8 Soyuz 10	Commander, Gagarin Cosmonaut Training Center.
Shchukin	1982	civilian	none	Killed in August 1988 plane crash.
Sheffer*	?	civilian	pending	In training as shuttle pilot.
Shonin	1960	AF/Lt. General	Soyuz 6	Returned to active duty, Soviet Air Force.
Smiriny*	1972	civilian	pending	Active cosmonaut.
Solovyev, A.	1976	AF/Colonel	Soyuz TM–5/Soyuz TM–4	Active cosmonaut.

TABLE 4-2.—SUMMARY OF SOVIET COSMONAUTS—Continued

Name	Year chosen	Service/rank	Flight(s)	Comments
Solovyev, V.	1978	civilian	Soyuz T-10 Soyuz T-15	Retired from cosmonaut corps in 1986.
Solovyeva*	1962	AF/Hon. Col. Eng.	none	Specialist in orbital mechanics at the Gagarin Cosmonaut Training Center.
Sorokin*	1964	AF/Lt. Colonel	none	Was a cosmonaut physician; died in 1976.
Stankyavichus*	1978	civilian	pending	Training as shuttle pilot.
Strekalov	1973	civilian	Soyuz T-3 Soyuz T-8 Soyuz T-11 [Soyuz T-10A][2]	Active cosmonaut.
Sultanov*	?	civilian	pending	In training as shuttle pilot.
Tereshkova	1962	AF/Hon. Col. Eng.	Vostok 6	First woman in space. Now head of the Soviet Friendship Society.
Titov, G.	1960	AF/Col. General	Vostok 2	Coordinator for the manufacture of launch vehicles, Ministry of Defense.
Titov, V.	1976	AF/Colonel	Soyuz T-8 Soyuz TM-4/Soyuz TM-6 [Soyuz T-10A][2]	Active cosmonaut.
Tolboev*	?	civilian	pending	In training as shuttle pilot.
Tresvyatskiy*	?	civilian	pending	In training as shuttle pilot.
Varlamov*	1960	AF	none	Died in October 1980.
Vasyutin	1976	AF/Colonel	Soyuz T-14/Soyuz T-13	Resigned. Now at Air Force Academy.
Viktorenko	1978	AF/Colonel	Soyuz TM-3/Soyuz TM-2	Training for next mission to Mir (Soyuz TM-8).
Volk	1978	civilian	Soyuz T-12	In training as shuttle pilot; head of shuttle pilot corps.
Volkov, A.	1976	AF/Colonel	Soyuz T-14/Soyuz T-13 Soyuz TM-7	Active cosmonaut.
Volkov, V.	1966	civilian	Soyuz 7 Soyuz 11	Killed during reentry of Soyuz 11.
Voloshin*	1965	AF	none	Resigned from cosmonaut corps in 1969.
Volynov	1960	AF/Colonel	Soyuz 5	Resigned. Commander of the cosmonaut detachment. Soyuz 21
Vorobyov*	1963	AF/Colonel	none	Resigned. Now in Soviet Air Force Reserve.
Voronov*	1963	AF/Colonel	none	Working at Soviet flight control center.
Yazdovskiy*	1969	civilian	none	Resigned from cosmonaut corps in 1973.
Yegorov	1964	civilian	Voskhod 1	Professor and head of medical research lab.
Yeliseyev	1966	civilian	Soyuz 4/Soyuz 5 Soyuz 8 Soyuz 10	Professor at Bauman Higher Technical School.
Yerkina*	1962	AF/Hon. Col. Eng.	none	Working in psychological training of cosmonauts at Gagarin Cosmonaut Training Center.
Zabolotskiy*	?	civilian	pending	In training as shuttle pilot.
Zaikin*	1960	AF/Colonel	none	Resigned from cosmonaut corps in 1968. Now working at Gagarin Cosmonaut Training Center.
Zaitsev	1987	civilian	none	Active cosmonaut; flight status uncertain due to medical problems.

TABLE 4–2.—SUMMARY OF SOVIET COSMONAUTS—Continued

Name	Year chosen	Service/rank	Flight(s)	Comments
Zholobov	1963	AF/Colonel Eng.	Soyuz 21	Retired from Soviet Air Force.
Zudov	1965	AF/Colonel	Soyuz 23	Working at Gagarin Cosmonaut Training Center.

AF=Soviet Air Force; Colonel Eng.=Colonel Engineer; Hon. Col. Eng.=Honorary Colonel Engineer.

* Denotes a cosmonaut recently identified through research conducted by Mr. Rex Hall, but for whom a complete biography is unavailable. Therefore the individual is not included in the biography section of this chapter. For completeness, names of all identified cosmonauts are included in this table and Table 4–1.

[1] Soyuz 18A, referred to by the Soviets as "April 5th Anomaly" was an unsuccessful Soyuz flight on April 5, 1975. The third stage of the rocket failed to ignite and the launch was aborted; the crew landed 1,600 kilometers downrange of the launch site. If successful, the mission would have been designated Soyuz 18; instead, the next in the series received that designation.

[2] Soyuz T–10A was an attempted Soyuz launch in September 1983 that was aborted when the launch vehicle caught fire just before launch. The Soyuz emergency abort tower was used to propel the capsule containing the crew away from the pad; they landed 3 kilometers away. If successful, the flight would have been designated Soyuz T–10; instead, the next Soviet mission received that designation.

TABLE 4-3.—CUMULATIVE COSMONAUT SPACE TIME

Name	Flight(s)	Total time in Space (hr:min)	EVA (hr:min)
Aksenov	Soyuz 22	284:11	
	Soyuz T-2		
Aleksandrov, A.	Soyuz T-9	7433:03	5:45
	Soyuz TM-3		
Artyukhin	Soyuz 14	377:30	
Atkov	Soyuz T-10	5686:50	
Bel'yayev	Voskhod 2	26:02	
Beregovoy	Soyuz 3	94:51	
Berezovoy	Soyuz T-5/T-7	5073:05	2:33
Bykovskiy	Vostok 5	497:47	
	Soyuz 22		
	Soyuz 31/29		
Demin	Soyuz 15	48:12	
Dobrovolskiy	Soyuz 11	570:22	
Dzhanibekov	Soyuz 27	3495:59	8:35
	Soyuz 39		
	Soyuz T-6		
	Soyuz T-12		
	Soyuz T-13		
Feoktistov	Voskhod 1	24:17	
Filipchenko	Soyuz 7	261:04	
	Soyuz 16		
Gagarin	Vostok 1	1:48	
Glazkov	Soyuz 24	425:26	
Gorbatko	Soyuz 7	732:48	
	Soyuz 24		
	Soyuz 37/36		
Grechko	Soyuz 17	3236:33	1:28
	Soyuz 26		
	Soyuz T-14		
Gubarev	Soyuz 17	899:36	
	Soyuz 28		
Ivanchenkov	Soyuz 29/31	3540:39	2:05
	Soyuz T-6		
Khrunov	Soyuz 4/5	47:49	1:00
Kizim	Soyuz T-3	8993:59	31:40
	Soyuz T-10		
	Soyuz T-15		
Klimuk	Soyuz 13	1890:19	
	Soyuz 18		
	Soyuz 30		
Komarov	Voskhod 1	51:05	
	Soyuz 1		
Kovalenok	Soyuz 25	5194:11	2:05
	Soyuz 29/31		
	Soyuz T-4		
Krikalev	Soyuz TM-7	3635:09	
Kubasov	Soyuz 6	450:00	
	Soyuz 19		
	Soyuz 36/35		
Laveikin	Soyuz TM-2/TM-3	4179:26	8:48
Lazarev	Soyuz 12	47:36	
	Soyuz 18A*		
Lebedev	Soyuz 13	5262:01	2:33
	Soyuz T-5/T-7		
Leonov	Voskhod 2	168:33	0:24
	Soyuz 19		
Levchenko	Soyuz TM-4/TM-3	189:58	
Lyakhov	Soyuz 32/34	7998:49	7:08
	Soyuz T-9		
	Soyuz TM-6/TM-5		

TABLE 4–3.—CUMULATIVE COSMONAUT SPACE TIME—Continued

Name	Flight(s)	Total time in Space (hr:min)	EVA (hr:min)
Makarov	Soyuz 12	497:43	
	Soyuz 18A*		
	Soyuz 27		
	Soyuz T-3		
Malyshev	Soyuz T-2	284:00	
	Soyuz T-11		
Manarov	Soyuz TM-4/TM-6	8782:39	13:37
Nikolayev	Vostok 3	519:21	
	Soyuz 9		
Patsayev	Soyuz 11	570:22	
Polyakov	Soyuz TM-6/TM-7	5782:36	
Popov	Soyuz 35/37	4814:45	
	Soyuz 40		
	Soyuz T-7/T-5		
Popovich	Vostok 4	448:27	
	Soyuz 14		
Romanenko	Soyuz 26	10338:21	10:16
	Soyuz 38		
	Soyuz TM-2/TM-3		
Rozhdestvenskiy	Soyuz 23	48:07	
Rukavishnikov	Soyuz 10	237:11	
	Soyuz 16		
	Soyuz 33		
Ryumin	Soyuz 25	8685:33	1:23
	Soyuz 32/34		
	Soyuz 35/37		
Sarafanov	Soyuz 15	48:12	
Savinykh	Soyuz T-4	6066:39	5:00
	Soyuz T-13		
	Soyuz TM-5/TM-4		
Savitskaya	Soyuz T-7/T-5	473:06	3:35
	Soyuz T-12		
Serebrov	Soyuz T-7/T-5	238:10	
	Soyuz T-8		
Sevast'yanov	Soyuz 9	1936:19	
	Soyuz 18		
Shatalov	Soyuz 4	237:58	
	Soyuz 8		
	Soyuz 10		
Shonin	Soyuz 6	118:43	
Solovyev, A.	Soyuz TM-5/TM-4	236:10	
Solovyev, V.	Soyuz T-10	8686:51	31:40
	Soyuz T-15		
Strekalov	Soyuz T-3	545:07	—
	Soyuz T-8		
	Soyuz T-11		
	(Soyuz T-10A)*		
Tereshkova	Vostok 6	70:50	
Titov, G.	Vostok 2	25:18	
Titov, V.	Soyuz T-8	8830:57	13:37
	Soyuz TM-4/TM-6		
	(Soyuz T-10A)*		
Vasyutin	Soyuz T-14	1557:52	
Viktorenko	Soyuz TM-3/TM-2	191:05	
Volk	Soyuz T-12	283:14	
Volkov, A.	Soyuz T-14	5193:01	6:00
	Soyuz TM-7		
Volkov, V.	Soyuz 7	689:02	
	Soyuz 11		
Volynov	Soyuz 5	1255:17	
	Soyuz 21		
Yegorov	Voskhod 1	24:17	

TABLE 4-3.—CUMULATIVE COSMONAUT SPACE TIME—Continued

Name	Flight(s)	Total time in Space (hr:min)	EVA (hr:min)
Yeliseyev	Soyuz 4/5 Soyuz 8 Soyuz 10	214:26	1:00
Zholobov	Soyuz 21	1182:23	
Zudov	Soyuz 23	48:07	
67 Cosmonauts	65 Missions	149,981:07	160:12

Includes only Soviet cosmonauts. For a list of foreigners who have flown on Soviet space missions, see Table 5-3.

EVA duration has never been officially announced by the Soviets for Voskhod 2 (Leonov) or Soyuz 4 and 5 (Khrunov and Yeliseyev). The data here are roughly equivalent to "hatch opening and hatch closing" times used in the U.S. Gemini program, as near as can be determined. Other estimates exist.

[*] Soyuz 18A and Soyuz T-10A were Soyuz launch failures. See the footnotes to Table 4-2 for further information. Soyuz 18A is counted in the launch totals in this report since the flight lasted 20 minutes. Soyuz T-10A did not get off the launch pad, so is not counted in the total number of flights for these men or total Soviet spaceflights; it is listed here only for completeness.

CHAPTER FIVE—FOREIGN COSMONAUT-RESEARCHERS ON SOVIET MISSIONS

The Soviet Union announced in December 1976 that persons from other Intercosmos countries would be trained as cosmonauts and that the first group, representing Czechoslovakia, Poland and the German Democratic Republic, was already in training. Other groups were subsequently chosen, as shown in Table 5-1.

In March 1978, the first "intercosmonaut," Vladimir Remek of Czechoslovakia, flew into space aboard Soyuz 28. By June 30, 1989, representatives from all the other Intercosmos countries (Bulgaria, Cuba, the German Democratic Republic, Hungary, Mongolia, Poland, Romania, Vietnam) as well as from Afghanistan, France, India, and Syria had made spaceflights on Soviet missions (see Tables 5-2 and 5-3). Individuals who fly on Soviet space missions are given approximately two years of training prior to their flight. In most cases, it is assumed that the backups will not make a flight. In the case of Bulgaria, however, the first mission (carrying Georgiy Ivanov) failed to dock with the Salyut 6 space station because of an engine failure. Thus, the Soviets provided a second opportunity to Bulgaria, and in 1988 Aleksandr Aleksandrov (Ivanov's backup, who should not be confused with the Soviet cosmonaut by the same name) flew to Mir. This time the mission was successful. French cosmonaut Jean-Loup Chretien is the only foreign cosmonaut-researcher to make two spaceflights (in 1982 and 1988).

As with the Soviet cosmonauts in Chapter 4, in some cases very little information is available on the foreign cosmonaut-researchers. The following biographies contain the best information that could be obtained.

TABLE 5-1.—STATUS OF FOREIGN COSMONAUT-RESEARCHERS ON SOVIET MISSIONS BY GROUP

Name	Country	Year of first flight	Status
First Intercosmos Selection (1976):			
Hermaszewski	Poland	1978	Resigned, in Polish Air Force
Jahn	East Germany	1978	Resigned, in East German Air Force
Jankowski	Poland	none	Resigned, in Polish Air Force
Kollner	East Germany	none	Resigned, in East German Air Force
Pelcak	Czechoslovakia	none	Resigned, in Czech Air Force
Remek	Czechoslovakia	1978	Resigned, in Czech Air Force
Second Intercosmos Selection (1978):			
Aleksandrov	Bulgaria	1988 [1]	Resigned, in Bulgarian Air Force
Dediu	Romania	none	Resigned, in Romanian Air Force
Farkas	Hungary	1980	Resigned, in Hungarian Air Force
Ganzorig	Mongolia	none	Resigned, in Mongolian Air Force
Gurragcha	Mongolia	1981	Resigned, in Mongolian Air Force
Ivanov	Bulgaria	1979	Resigned, in Bulgarian Air Force
Lopez Falcon	Cuba	none	Resigned, in Cuban Air Force
Magyari	Hungary	none	Resigned, in Hungarian Air Force
Prunariu	Romania	1981	Resigned, in Romanian Air Force
Tamayo Mendez	Cuba	1980	Resigned, in Cuban Air Force
Third Intercosmos Selection (1979):			
Bui Thanh Liem	Vietnam	none	Deceased (jet crash)
Pham Tuan	Vietnam	1980	Resigned, in Vietnamese Air Force
First International Selection (1980):			
Baudry	France	see note [2]	Working at French space agency
Chretien	France	1982 [3]	Working at French space agency
Second International Selection (1982):			
Malhoutra	India	none	Resigned, in Indian Air Force
Sharma	India	1984	Resigned, in Indian Air Force.
Third International Selection (1985):			
Faris	Syria	1987	Resigned, in Syrian Air Force
Habib	Syria	none	Resigned, in Syrian Air Force
Fourth International Selection (1986):			
Chretien	France	1982 [3]	Working at French space agency
Tognini	France	pending	Awaiting flight assignment
Fifth International Selection (1987):			
Aleksandrov	Bulgaria	1988 [1]	Resigned, in Bulgarian Air Force
Stoyanov	Bulgaria	none	Resigned, in Bulgarian Air Force
Sixth International Selection (1988):			
Dauran	Afghanistan	none	Resigned, in Afghan Air Force
Mohmand	Afghanistan	1988	Resigned, in Afghan Air Force

---

[1] Aleksandrov flew on a mission in 1988 after being reselected as a cosmonaut-researcher candidate in 1987.

[2] Baudry made a spaceflight on the U.S. space shuttle (see chapter 3).

[3] Chretien was originally selected in 1980, and made a spaceflight in 1982. He was reselected in 1986 and flew again in 1988.

BIOGRAPHIES OF FOREIGN COSMONAUT-RESEARCHERS ON SOVIET MISSIONS

Aleksandr Aleksandrov; Bulgaria; Major, Bulgarian Air Force; born December 1, 1951, Omurtag. **Spaceflight: Soyuz TM-5**

Graduated from the Benkovskiy Higher Military Aviation School in 1974, and served in the Bulgarian Air Force. He began training as a cosmonaut in 1978 and was backup cosmonaut-researcher for Soyuz 33. Subsequently he received a degree of candidate of technical sciences from the Soviet Institute of Space Research, and worked as Deputy Director of the Bulgarian Institute for Space Research. In 1987, he returned to cosmonaut training and flew as cosmonaut-researcher on the Soyuz TM-5/Mir/Soyuz TM-4 mission.

cnes
PATRICK
FRA
NASA
NASA

Patrick Baudry
Biography under Payload Specialists and Passengers on U.S. Missions (Chapter 3). Baudry was Chretien's backup for Soyuz T-6 in 1982, and later flew on a U.S. space shuttle mission.

Bui Thanh Liem; Vietnam; Captain, Red Star Air Regiment; born June 30, 1949, Hanoi; died in 1981 in a plane crash; was married, one child.

Was chosen as a Vietnamese cosmonaut in 1979, and served as backup to Pham Tuan on the Soyuz 37/Soyuz 36/Salyut 6 mission.

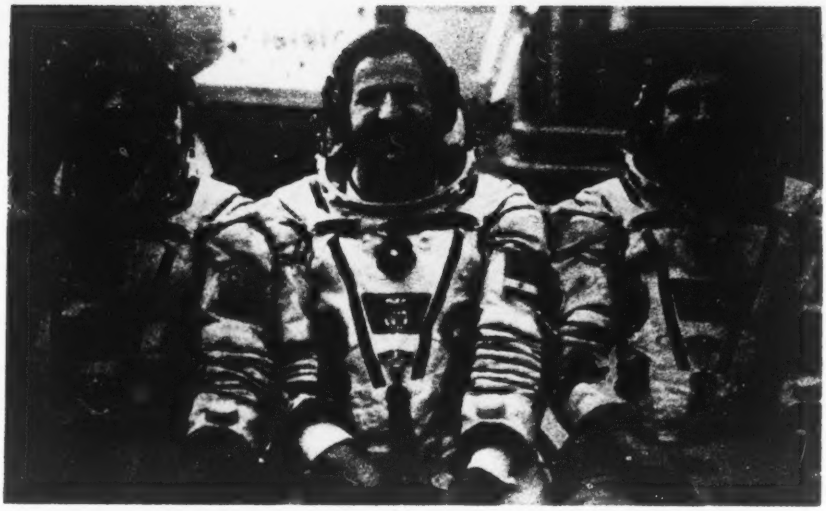
J.L. CHRETIEN
Ж.Л. КРЕТЬЕН
САЛЮТ
cnes
FRANCE

Jean-Loup Chretien; France; Colonel, French Air Force; born August 20, 1938, La Rochelle, France; married, four children (by a previous marriage). **Spaceflights: Soyuz T-6, Soyuz TM-7**

Graduated from L'Ecole de l'Air (Air School) in 1961, and has a master's degree in aeronautical engineering. He served in the French Air Force as a fighter pilot and became a test pilot in 1970. In 1977, he was named assistant to the head of air defenses for southern France. He was chosen as a cosmonaut-researcher candidate in 1980 and flew on the Soyuz T-6/Salyut 7 mission in 1982. He then served as head of the Manned Flight Division of the French space agency, CNES, and was Patrick Baudry's backup for a 1985 U.S. space shuttle mission. When agreement was reached with the Soviet Union to launch another French cosmonaut, he was again chosen for training and returned to the Soviet Union in 1986. He made his second spaceflight on Soyuz TM-7/Mir/Soyuz TM-6 in 1988, becoming the first non-Russian, non-American to make a spacewalk. He is now working again for CNES.

Muhammad Ghulam Masum Dauran; Afghanistan; Colonel, Afghanistan Air Force; born 1954, Nejrab district, Kapsia province. Military pilot. Began cosmonaut training at the Gagarin Cosmonaut Training Center in February 1988, and was backup crew cosmonaut-researcher for Soyuz TM-6.

Dumitru Dediu; Romania; Romanian Air Force; born May 12, 1942. Selected as a Romanian cosmonaut in 1978 and served as backup to Prunariu for Soyuz 40/Salyut 6.



Muhammad Ahmed Faris (center); Syria; Lieutenant-Colonel, Syrian Air Force; born May 26, 1951, Aleppo, Syria; married, two children. **Spaceflight: Soyuz TM-3/TM-2**

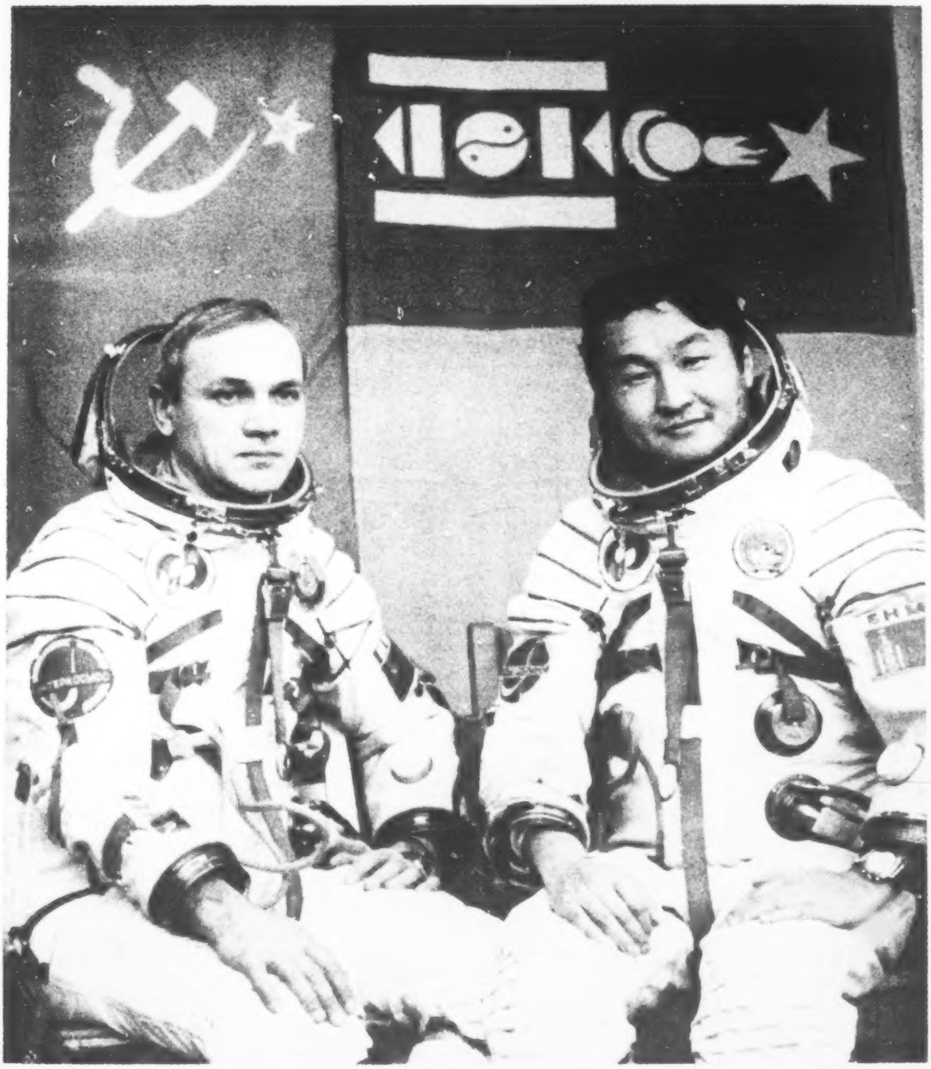
Graduated from military aviation school in 1973. Served as pilot in the Syrian Air Force. Began training at the Gagarin Cosmonaut Training Center in 1985. He flew as cosmonaut-researcher on the Soyuz TM-3/Mir/Soyuz TM-2 mission.

Bertalan Farkas; Hungary; Lieutenant Colonel, Hungarian Air Force; born August 2, 1949, Gyulahaza, Hungary; married, two children. **Spaceflight: Soyuz 36/35**

Graduated from the Gyorgy Kilian Aeronautical Engineering College, Szolnok in 1969. He joined the cosmonaut corps in 1978 as the first Hungarian cosmonaut. He was cosmonaut-researcher for the Soyuz 36/Salyut 6/Soyuz 35 mission.

Maidarzhavyn Ganzorig; Mongolia; Captain-Engineer, Mongolian People's Army; born February 6, 1949, Ix-Xyzhirt Tsetserleg Ava-Xangaiskovo; married, two children.

Graduated from Kiev Order of Lenin Polytechnical Institute in 1975 as a specialist in engineering. He became a military engineer in 1978. His space career began with training in April 1978. He was the backup cosmonaut for Gurragcha on the Soyuz 39 mission.



Judgerdemidiyin Gurragcha (on right); Mongolia; Major General, Mongolian People's Army; born December 5, 1947, in the Guran-Bulak settlement of the Bulgan Province; married, one child.
Spaceflight: Soyuz 39

Served in the Mongolian People's Army beginning in 1978. Graduated from a military school of aircraft technicians in the Soviet Union and from the Zhukovskiy Air Force Academy in 1977. He joined the cosmonaut corps in 1978 and was cosmonaut-researcher on Soyuz 39/Salyut 6.

Munir Habib; Syria; Lieutenant Colonel, Syrian Air Force; born September 3, 1953; married, two children.

A military flight instructor, he began training at the Gagarin Cosmonaut Center in 1985 and was the backup cosmonaut-researcher for Soyuz TM-3.

Miroslaw Hermaszewski; Poland; Colonel, Polish Air Force; born September 15, 1941, Lipniki, Poland; married, two children. **Spaceflight: Soyuz 30**

Graduated from the Officers Flying School at Deblin in the 1964 and from the Karol Swierczewski General Staff Academy in 1971. He was selected as the first Polish cosmonaut in 1976. He was cosmonaut-researcher for Soyuz 30/Salyut 6.

Georgiy Ivanov Ivanov; Bulgaria; Colonel, Bulgarian Air Force; born July 2, 1940, Lovech, Bulgaria; married, one child. **Spaceflight: Soyuz 33**

Graduated from the Georgiy Benkovski Higher Air Force School in 1964, served in the Bulgarian Air Force, and was selected as the first Bulgarian cosmonaut in March 1978. He was cosmonaut-researcher on Soyuz 33, which was unable to dock with the Salyut 6 space station, because of an engine failure.

INTERKOSMOS

Sigmund Jähn; German Democratic Republic; General, GDR Air Force; born February 13, 1937, Rautenkranz, Germany; married, two children. **Spaceflight: Soyuz 31/29**

Graduated from Gagarin Air Force Academy in 1970, was selected as East German cosmonaut in 1976, and was cosmonaut-researcher for the Soyuz 31/Salyut 6/Soyuz 29 mission.

Zenon Jankowski; Poland; Colonel, Polish Air Force; born November 22, 1937, Poznan, Poland; married, one child.

Attended Air Force Officers School at the Karol Swierczewski General Staff Academy. He was selected as the second Polish cosmonaut in 1976 and was backup to Hermaszewski for Soyuz 30.

Eberhard Köllner; German Democratic Republic; Lieutenant Colonel, GDR Air Force; born September 29, 1939, Strassfurt; married, two children.

Graduated from Franz Mering Higher Air Force School, and from the Yuriy Gagarin Air Force Academy (1970). He was the backup cosmonaut-researcher for Soyuz 31.

Jose Armando Lopez Falcon; Cuba; Captain, Cuban Air Force; born February 8, 1950, Havana; married, one child.

Joined the cosmonaut corps in 1978, and was backup cosmonaut-researcher for Tamayo Mendez on Soyuz 38.

NO PHOTOGRAPH AVAILABLE

Bela Magyari; Hungary; Major, Hungarian Air Force; born August 8, 1949, Kiskuneflegyhaza, Hungary; married, one chid.

Graduated from the Georgiy Kilian Aeronautical College, Szolnok, in 1969; and was selected as the second Hungarian cosmonaut in 1978. He served as backup to Farkas for the Soyuz 36/Soyuz 35/Salyut 6 mission.

Ravish Malhoutra; India; Lieutenant Colonel, Indian Air Force; born December 25, 1943, Calcutta; married, two children.

Graduated from India's National Defense Academy, and served as a test pilot in the Indian Air Force. He was the backup cosmonaut-researcher for Soyuz T-11.

Abdul Ahad Mohmand; Afghanistan; Captain, Afghanistan Air Force; born January 1, 1959, settlement of Sard, Shangar district, Gazni province (of Pushtun nationality). **Spaceflight: Soyuz TM-6**

He entered the Polytechnic Institute in Kabul in 1976. He was drafted into the Army in 1978 and went to the Soviet Union for military training. After completing military pilot training, he served in the Afghanistan Air Force. In 1987, he graduated from the Military Aviation Academy and extended his flight service. He began cosmonaut training at the Gagarin Cosmonaut Training Center in February 1988 and was the cosmonaut-researcher aboard Soyuz TM-6.

Oldrich Pelčák; Czechoslovakia; Major, Czechoslovak Air Force; born November 2, 1943, Gottwaldov, Czechoslovakia; married, two children.

Graduated from Uherske-Hradiste engineering junior college (1962); Kosice Air Force College (1965); and Gagarin Air Force Academy (1972). He was the Czechoslovak backup for Remek on Soyuz 28/Salyut 6.

Dumitru Prunariu; Romania; Major-Engineer, Romanian Air Force; born September 27, 1952, Brasov, Romania; married, two children. **Spaceflight: Soyuz 40**

Graduated from Bucharest Polytechnical Institute in 1976 and worked as an aircraft engineer. He graduated from the air force officers' school and served in the Romanian Air Force. He began cosmonaut training in 1978 and was cosmonaut-researcher on Soyuz 40/Salyut 6.

Pham Tuan; Vietnam; Colonel, Vietnamese Air Force; born February 14, 1947, Quoc Tuan Village, Thai Binh Province; married, one child. **Spaceflight: Soyuz 37/36**

Served in the Vietnamese People's Army, enrolled in the Soviet Air Force Academy in 1977, and joined the cosmonaut corps in 1979. He was cosmonaut-researcher on the Soyuz 37/Salyut 6/Soyuz 36 mission.

Vladimir Remek; Czechoslovakia; Colonel, Czechoslovak Air Force; born September 26, 1948, Ceske-Budejovice, Czechoslovakia; divorced. **Spaceflight: Soyuz 28**

Graduated from the Kosice Air Force College, became a pilot second class in an air unit of the Czechoslovak People's Army, went to the Soviet Union in 1972 to study at the Gagarin Air Force Academy, returned to Czechoslovakia as a military pilot, and was chosen as a candidate for cosmonaut training in 1976. He was cosmonaut-researcher for Soyuz 28/Salyut 6, becoming the first non-American, non-Russian in space.

R. SHARMA
Р. ШАРМА

Rakesh Sharma; India; Major, Indian Air Force; born January 13, 1949, Patiala, India; married, two children. **Spaceflight: Soyuz T-11**

Graduated from the Indian National Defense Academy, and served as a test pilot in the Indian Air Force. In 1982, Sharma began training at the Gagarin Cosmonaut Training center and flew on Soyuz T-11.

Krasimir Stoyanov; Bulgaria; Captain, Bulgarian Air Force; born January 24, 1951.

Served as backup Bulgarian cosmonaut-researcher for Soyuz TM-5.

Arnaldo Tamayo Mendez; Cuba; Colonel, Cuban Air Force; born January 29, 1942, Guantanamo, Cuba. **Spaceflight: Soyuz 38**

Attended an air force academy in the Soviet Union, served as a pilot in Cuba's armed forces, and was chosen as a cosmonaut-researcher candidate in 1978. He was cosmonaut-researcher for Soyuz 38/Salyut 6.

NO PHOTOGRAPH AVAILABLE

Michel Tognini; France; Lieutenant Colonel, French Air Force; born September 30, 1949, Vincennes; married, two children (by a previous marriage).

Graduated from L'Ecole de L'Air (Air School) in 1973 and became a fighter pilot in 1974. In 1982, he graduated from the Empire Test Pilot's School (Great Britain), and earned a degree in military studies in 1983. He was head test pilot at the French Test Flight Centre when chosen as a cosmonaut-researcher candidate in 1986, and he served as backup for Soyuz TM–7/Mir/Soyuz TM–6. He is now working at the French space agency, CNES, and may fly on a future Soviet-French spaceflight.

TABLE 5-2.—SUMMARY OF FOREIGN COSMONAUT-RESEARCHERS ON SOVIET MISSIONS

Name	Country	Flight(s)	Comments
Aleksandrov	Bulgaria	Soyuz TM-5/TM-4	Backup for Ivanov in 1979; was second Bulgarian cosmonaut in 1988.
Baudry	France	see comments	Backup for Chretien in 1982; flew on U.S. space shuttle in 1985 (see chapter 3).
Bui Thanh Liem	Vietnam	none	Backup for Pham Tuan. Died in plane crash.
Chretien	France	Soyuz T-6 Soyuz TM-7	First Frenchman in space (1982); first non-Russian, non-American to make a spacewalk (1988).
Dauran	Afghanistan	none	Backup for Mohmand.
Dediu	Romania	none	Backup for Prunariu.
Faris	Syria	TM-3	First Syrian in space.
Farkas	Hungary	Soyuz 36/35	First Hungarian cosmonaut.
Ganzorig	Mongolia	none	Backup for Gurragcha.
Gurragcha	Mongolia	Soyuz 39	First Mongolian in space.
Habib	Syria	none	Backup for Faris.
Hermaszewski	Poland	Soyuz 30	First Polish cosmonaut.
Ivanov	Bulgaria	Soyuz 33	First Bulgarian cosmonaut.
Jahn	East Germany	Soyuz 31	First East German cosmonaut.
Jankowski	Poland	none	Backup for Hermaszewski.
Kollner	East Germany	none	Backup for Jahn.
Lopez Falcon	Cuba	none	Backup for Tamayo Mendez.
Magyari	Hungary	none	Backup for Farkas.
Malhoutra	India	none	Backup for Sharma.
Mohmand	Afghanistan	TM-6	First Afghan in space.
Pelcak	Czechoslovakia	none	Backup for Remek.
Prunariu	Romania	Soyuz 40	First Romanian cosmonaut.
Pham Tuan	Vietnam	Soyuz 37/36	First Vietnamese in space.
Remek	Czechoslovakia	Soyuz 28	First non-American, non-Russian in space. First Czech in space.
Sharma	India	Soyuz T-11	First Indian in space.
Stoyanov	Bulgaria	none	Backup for Aleksandrov in 1988.
Tamayo Mendez	Cuba	Soyuz 38	First Cuban in space.
Tognini	France	none	Backup for Chretien in 1988.

TABLE 5-3.—CUMULATIVE FOREIGN COSMONAUT-RESEARCHER SPACE TIME ON SOVIET MISSIONS

Name	Flight(s)	Total time in space (hr:min)	EVA (hr:min)
Aleksandrov, A. (Bulg.)	Soyuz TM-5	236:10	
Chretien (France)	Soyuz T-6 Soyuz TM-7	783:58	6:00
Faris (Syria)	Soyuz TM-3/TM-2	191:05	
Farkas (Hungary)	Soyuz 36/35	188:46	
Gurragcha (Mongolia)	Soyuz 39	188:43	
Hermaszewski (Poland)	Soyuz 30	190:03	
Ivanov (Bulgaria)	Soyuz 33	47:01	
Jahn (E. Germany)	Soyuz 31/29	188:49	
Mohmand (Afghanistan)	Soyuz TM-6	212:27	
Pham Tuan (Vietnam)	Soyuz 37/36	188:42	
Prunariu (Romania)	Soyuz 40	188:41	
Remek (Czech.)	Soyuz 28	190:16	
Sharma (India)	Soyuz T-11	189:41	
Tamayo Mendez (Cuba)	Soyuz 38	188:43	
14 Cosmonaut-Researchers	15 Missions	3173:05	6:00

Includes all Intercosmos and other international cosmonaut-researchers launched by the Soviet Union.

CHAPTER SIX—COMPARATIVE DATA ON AMERICAN AND SOVIET SPACEFLIGHTS

Table 6–1 compares the piloted spaceflights of the United States and the Soviet Union. The table is set up in chronological order with the name of the spacecraft in the left column together with its popular label or call sign, if any. The next columns give the launch date, the crew, extravehicular activity (in space or on the lunar surface) if any, the duration of the mission, the national cumulative person-hours, and any salient comments. Figures for national cumulative person-hours through are compiled by taking the cumulative person hours through the previous flight of the same country and adding the additional person-hours of the new flight. If there was more than one person on the flight, the flight time is multiplied by the number of people to obtain the person-hours figure.

Table 6–2 lists the prime and backup crews of the various flights by program. Note that the United States no longer names backup crews for shuttle flights.

Table 6–3 lists the hours spent in space flight (other than the X-15) by each astronaut or cosmonaut.

Table 6–4 lists the hours spent performing extravehicular activity (EVA) either in space or on the lunar surface by each astronaut or cosmonaut.

Table 6–5 lists the astronauts and cosmonauts who have died either in their program or after leaving it, date, and cause of death.

Soviet mission designations can be confusing. See the introduction to Chapter 4 for an explanation of designations such as Soyuz 37/36.

TABLE 6-1.—SUMMARY LIST OF PILOTED SPACE FLIGHTS

Launch date	Vehicle name	Crew (No. of flights)	Weight (kgs)	Ship duration (hr:min)	Crew duration (hr:min)	National Cumulative person-hours (hr:min)
1961						
Apr. 12	Vostok 1	Gagarin	4725	1:48	same	1:48
May 5	MR-3	A. Shepard	1290	:15	same	:15
July 21	MR-4	Grissom	1286	:16	same	:31
Aug. 6	Vostok 2	G. Titov	4731	25:18	same	27:06
1962						
Feb. 20	MA-6	Glenn	1355	4:55	same	5:26
May 24	MA-7	Carpenter	1349	4:56	same	10:22
Aug. 11	Vostok 3	Nikolayev	4722	94:22	same	121:28
Aug. 12	Vostok 4	Popovich	4728	70:57	same	192:25
Oct. 3	MA-8	Schirra	1373	9:13	same	19:35
1963						
May 15	MA-9	Cooper	1376	34:20	same	53:55
June 14	Vostok 5	Bykovskiy	4720	119:06	same	311:31
June 16	Vostok 6	Tereshkova	4713	70:50	same	382:21
1964						
Oct. 12	Voskhod 1	Komarov Yegorov Feoktistov	5320	24:17	same	455:12
1965						
Mar. 18	Voskhod 2	Bel'yayev Leonov	5682	26:02	same	507:16
Mar. 23	Gemini 3	Grissom (2) Young	3225	4:53	same	63:41
June 3	Gemini 4	McDivitt White	3574	97:56	same	259:33
Aug. 21	Gemini 5	Cooper (2) Conrad	3605	190:55	same	641:23
Dec. 4	Gemini 7	Borman Lovell	3663	330:35	same	1302:33
Dec. 15	Gemini 6	Schirra (2) Stafford	3546	25:51	same	1354:15
1966						
Mar. 16	Gemini 8	Armstrong Scott	3788	10:41	same	1375:37
June 3	Gemini 9	Stafford (2) Cernan	3750	72:21	same	1520:19
July 18	Gemini 10	Young (2) Collins	3741	70:47	same	1661:53
Sept. 12	Gemini 11	Conrad (2) Gordon	3860	71:17	same	1804:27
Nov. 11	Gemini 12	Lovell (2) Aldrin	3763	94:35	same	1993:37
1967						
Jan. 27	AS-204	Grissom (3)+ White (2)+ Chaffee+	20412	(1)		
Apr. 23	Soyuz 1	Komarov (2)+	6450	26:48	same	534:04
1968						
Oct. 11	Apollo 7	Schirra (3) Eisele Cunningham	20569	260:09	same	2774:04
Oct. 26	Soyuz 3	Beregovoy	6575	94:51	same	628:55

TABLE 6-1.—SUMMARY LIST OF PILOTED SPACE FLIGHTS—Continued

Launch date	Vehicle name	Crew (No. of flights)	Weight (kgs)	Ship duration (hr:min)	Crew duration (hr:min)	National Cumulative person-hours (hr:min)
1968 (Cont.)						
Dec. 21	Apollo 8	Borman (2)	43663	147:01	same	3215:07
		Lovell (3)				
		Anders				
1969						
Jan. 14	Soyuz 4*	Shatalov	6625	71:21	71:21	795:54
		Yeliseyev			47:49	
		Khrunov			47:49	
Jan. 15	Soyuz 5*	Volynov	6585	72:54	72:54	868:48
Mar. 3	Apollo 9	McDivitt (2)	43185	241:01	same	3938:10
		Scott (2)				
		Schweickart				
May 18	Apollo 10	Stafford (3)	48638	192:03	same	4514:19
		Young (3)				
		Cernan (2)				
July 16	Apollo 11	Armstrong (2)	49698	195:19	same	5100:16
		Collins (2)				
		Aldrin (2)				
Oct. 11	Soyuz 6	Shonin	6577	118:43	same	1106:14
		Kubasov				
Oct. 12	Soyuz 7	Filipchenko	6570	118:40	same	1462:14
		Gorbatko				
		V. Volkov				
Oct. 13	Soyuz 8	Shatalov (2)	6646	118:51	same	1699:56
		Yeliseyev (2)				
Nov. 14	Apollo 12	Conrad (3)	49804	244:36	same	5834:04
		Gordon (2)				
		Bean				
1970						
Apr. 11	Apollo 13	Lovell (4)	49990	142:55	same	6262:49
		Haise				
		Swigert				
June 1	Soyuz 9	Nikolayev (2)	6500	424:59	same	2549:54
		Sevast'yanov				
1971						
Jan. 31	Apollo 14	A. Shepard (2)	46347	216:02	same	6910:55
		Roosa				
		Mitchell				
Apr. 19	Salyut 1	(Occupied by Soyuz 11 crew).	18600			
Apr. 22	Soyuz 10	Shatalov (3)	6575	47:46	same	2693:12
		Yeliseyev (3)				
		Rukavishnikov				
June 6	Soyuz 11	Dobrovolskiy +	6575	570:22	same	4404:18
		V. Volkov (2) +				
		Patsayev +				
July 26	Apollo 15	Scott (3)	52759	295:12	same	7796:31
		Irwin				
		Worden				
1972						
Apr. 16	Apollo 16	Young (4)	51571	265:51	same	8594:04
		Mattingly				
		Duke				
Dec. 7	Apollo 17	Cernan (3)	51808	301:52	same	9499:40
		Schmitt				
		Evans				

TABLE 6-1.—SUMMARY LIST OF PILOTED SPACE FLIGHTS—Continued

Launch date	Vehicle name	Crew (No. of flights)	Weight (kgs)	Ship duration (hr:min)	Crew duration (hr:min)	National Cumulative person-hours (hr:min)
1973						
May 14	Skylab 1	(Occupied by Skylab 2, 3 & 4 crews).	89439			
May 25	Skylab 2	Conrad (4) Kerwin Weitz	30803	672:50	same	11518:10
July 28	Skylab 3	Bean (2) Garriott Lousma	30694	1427:09	same	15799:37
Sept. 27	Soyuz 12	Lazarev Makarov	6575	47:16	same	4498:50
Nov. 16	Skylab 4	Carr E. Gibson Pogue	31232	2017:16	same	21851:25
Dec. 18	Soyuz 13	Klimuk Lebedev	6575	188:56	same	4876:42
1974						
June 24	Salyut 3	(Occupied by Soyuz 14 crew).	18900			
July 3	Soyuz 14	Popovich (2) Artyukhin	6570	377:30	same	5631:42
Aug. 26	Soyuz 15	Sarafanov Demin	6570	48:12	same	5728:06
Dec. 2	Soyuz 16	Filipchenko (2) Rukavishnikov (2)	6570	142:24	same	6012:54
Dec. 26	Salyut 4	(Occupied by Soyuz 17, 18 crews).	18900			
1975						
Jan. 10	Soyuz 17	Gubarev Grechko	6570	709:20	same	7431:34
Apr. 5	Anomaly (Soyuz 18A)	Lazarev (2) Makarov (2)	6570	:20	same	7432:14
May 24	Soyuz 18	Klimuk (2) Sevast'yanov (2)	6570	1511:20	same	10454:54
July 15	Soyuz 19	Leonov (2) Kubasov (2)	6800	142:31	same	10739:56
July 15	ASTP	Stafford (4) Slayton Brand	14743	217:28	same	22503:49
1976						
June 22	Salyut 5	(Occupied by Soyuz 21, 24 crews).	18900			
July 6	Soyuz 21	Volynov (2) Zholobov	6570	1182:23	same	13104:42
Sept. 15	Soyuz 22	Bykovskiy (2) Aksenov	6570	189:52	same	13484:26
Oct. 14	Soyuz 23	Zudov Rozhdestvenskiy	6570	48:07	same	13580:40
1977						
Feb. 7	Soyuz 24	Gorbatko (2) Glazkov	6570	425:26	same	14431:32
Sept. 29	Salyut 6	(Occupied by Soyuz 26, 27, 28, 29, 30, 31 32, 35, 36, 37, 38, T2, T3, T4, 39, 40 crews).	18900			
Oct. 9	Soyuz 25	Kovalenok Ryumin	6570	48:45	same	14592:02

TABLE 6-1.—SUMMARY LIST OF PILOTED SPACE FLIGHTS—Continued

Launch date	Vehicle name	Crew (No. of flights)	Weight (kgs)	Ship duration (hr:min)	Crew duration (hr:min)	National Cumulative person-hours (hr:min)
1977 (Cont.)						
Dec. 10	Soyuz 26	Romanenko Grechko (2)	6570	898:06	2314:00	19157:02
1978						
Jan. 10	Soyuz 27	Dzhanibekov Makarov (3)	6570	1558:53	142:59	19443:00
Mar. 2	Soyuz 28	Gubarev (2) Remek (Czechoslovakia)	6570	190:16	same	19823:32
June 15	Soyuz 29	Kovalenok (2) Ivanchenkov	6570	1911:23	3350:48	26525:08
June 27	Soyuz 30	Klimuk (3) Hermaszewski (Poland)	6570	190:03	same	26905:14
Aug. 26	Soyuz 31	Bykovskiy (3) Jahn (German Dem. Rep.)	6570	1628:14	188:49	27282:52
1979						
Feb. 25	Soyuz 32	Lyakhov Ryumin (2) (Returned unoccupied)	6570	2596:24	4200:36	35684:04
Apr. 10	Soyuz 33	Rukavishnikov (3) Ivanov (Bulgaria)	6570	47:01	same	35778:06
June 6	Soyuz 34	(Launched unoccupied, returned Soyuz 32 crew).	6570	1770:17		
1980						
Apr. 9	Soyuz 35	Popov Ryumin (3)	6570	1321:29	4436:12	44650:30
May 26	Soyuz 36	Kubasov (3) Farkas (Hungary)	6570	1580:54	188:46	45028:02
June 5	Soyuz T–2	Malyshev Aksenov (2)	7000	94:19	same	45216:40
July 23	Soyuz 37	Gorbatko (3) Pham Tuan (Vietnam)	6570	1911:17	188:42	45594:04
Sept. 18	Soyuz 38	Romanenko (2) Tamayo Mendez (Cuba)	6570	188:43	same	45971:30
Nov. 27	Soyuz T–3	Kizim Makarov (4) Strekalov	7000	307:08	same	46892:54
1981						
Mar. 12	Soyuz T–4	Kovalenok (3) Savinykh	7000	1794:38	same	50482:10
Mar. 22	Soyuz 39	Dzhanibekov (2) Gurragcha (Mongolia)	6570	188:43	same	50859:36
Apr. 12	STS 1	Young (5) Crippen	98658	54:21	same	22612:31
May 14	Soyuz 40	Popov (2) Prunariu (Romania)	6570	188:41	same	51236:58
Nov. 12	STS–2	Engle Truly	103811	54:13	same	22720:57
1982						
Mar. 22	STS–3	Lousma (2) Fullerton	106000	192:05	same	23105:07
Apr. 19	Salyut 7	(Occupied by Soyuz T–5, T–6, T–7, T–9, T–10, T–11, T–12, T–13, T–14 and T–15 crews).	18900			
May 13	Soyuz T–5	Berezovoy Lebedev (2)	7000	2549:06	5073:05	61383:08

TABLE 6–1.—SUMMARY LIST OF PILOTED SPACE FLIGHTS—Continued

Launch date	Vehicle name	Crew (No. of flights)	Weight (kgs)	Ship duration (hr:min)	Crew duration (hr:min)	National Cumulative person-hours (hr:min)
1982 (Cont.)						
June 24	Soyuz T–6	Dzhanibekov (3) Ivanchenkov (2) Chretien (France)	7000	189:51	same	61952:41
June 27	STS–4	Mattingly (2) Hartsfield	108797	169:11	same	23443:29
Aug. 19	Soyuz T–7	Popov (3) Serebrov Savitskaya	7000	2712:51	189:52	62522:17
Nov. 11	STS–5	Brand (2) Overmyer J. Allen Lenoir	111201	122:14	same	23932:25
1983						
Apr. 4	STS–6	Weitz (2) Bobko Musgrave Peterson	114201	120:24	same	24414:01
Apr. 20	Soyuz T–8	V. Titov Strekalov (2) Serebrov (2)	7000	48:18	same	62667:11
June 18	STS–7	Crippen (2) Hauck Ride Fabian Thagard	110013	146:24	same	25146:01
June 27	Soyuz T–9	Lyakhov (2) A. Aleksandrov	7000	3585:46	same	69838:43
Aug. 30	STS–8	Truly (2) Brandenstein Thornton Bluford D. Gardner	104675	145:09	same	25871:46
Sept. 26	(Soyuz T–10A)	V. Titov Strekalov	(2)			
Nov. 28	STS–9	Young (6) Shaw Parker Garriott (2) Lichtenberg Merbold (W. Germany)	110031	247:47	same	27358:28
1984						
Feb. 3	STS 41–B	Brand (3) R. Gibson McCandless McNair Stewart	113508	191:16	same	28314:48
Feb. 8	Soyuz T–10	Kizim (2) V. Solovyev Atkov	7000	1510:43	5686:50	86899:13
Apr. 3	Soyuz T–11	Malyshev (2) Strekalov (3) Sharma (India)	7000	4365:48	189:41	87468:16
Apr. 6	STS 41–C	Crippen (3) Scobee Hart van Hoften G. Nelson	115342	167:40	same	29153:08

TABLE 6-1.—SUMMARY LIST OF PILOTED SPACE FLIGHTS—Continued

Launch date	Vehicle name	Crew (No. of flights)	Weight (kgs)	Ship duration (hr:min)	Crew duration (hr:min)	National Cumulative person-hours (hr:min)
1984 (Cont.)						
July 17	Soyuz T-12	Dzhanibekov (4) Savitskaya (2) Volk	7000	283:14	same	88317:58
Aug. 30	STS 41-D	Hartsfield (2) Coats Resnik Hawley Mullane C. Walker	119491	144:57	same	30022:50
Oct. 5	STS 41-G	Crippen (4) McBride Ride (2) Sullivan Leestma Scully-Power Garneau (Canada)	110119	197:24	same	31404:38
Nov. 8	STS 51-A	Hauck (2) D. Walker J. Allen (2) A. Fisher D. Gardner (2)	119421	191:45	same	32363:23
1985						
Jan. 24	STS 51-C	Mattingly (3) Shriver Onizuka Buchli Payton	N/A	73:33	same	32731:08
Apr. 12	STS 51-D	Bobko (2) D. Williams Hoffman Griggs Seddon C. Walker (2) Garn	113802	167:55	same	33906:33
Apr. 29	STS 51-B	Overmyer (2) Gregory Thornton (2) Thagard (2) Lind van den Berg Wang	111982	168:09	same	35083:36
June 6	Soyuz T-13	Dzhanibekov (5) Savinykh (2)	7000	2691:12	2691:12 4035:51	95045:01
June 17	STS 51-G	Brandenstein (2) Creighton Lucid Nagel Fabian (2) Baudry (France) Sultan Salman Al-Saud (S. Arabia)	116310	169:39	same	36271:09
July 29	STS 51-F	Fullerton (2) Bridges Henize England Musgrave Bartoe Acton	114590	190:45	same	37606:24

TABLE 6–1.—SUMMARY LIST OF PILOTED SPACE FLIGHTS—Continued

Launch date	Vehicle name	Crew (No. of flights)	Weight (kgs)	Ship duration (hr:min)	Crew duration (hr:min)	National Cumulative person-hours (hr:min)
1985 (Cont.)						
Aug. 27	STS 51–I	Engle (2)	118981	170:18	same	38457:54
		Covey				
		Lounge				
		W. Fisher				
		van Hoften (2)				
Sept. 17	Soyuz T–14	Vasyutin	7000	1557:52	1557:52	98373:58
		Grechko (3)			213:13	
		A. Volkov			1557:52	
Oct. 3	STS 51–J	Bobko (3)	N/A	97:47	same	38946:49
		Grabe				
		Hilmers				
		Stewart (2)				
		Pailes				
Oct. 30	STS 61–A	Hartsfield (3)	110568	168:44	same	40296:41
		Nagel				
		Buchli (2)				
		Bluford (2)				
		Dunbar				
		Ockels (ESA)				
		Furrer (FRG)				
		Messerschmid (FRG)				
Nov. 26	STS 61–B	Shaw (2)	118664	165:05	same	41452:16
		O'Connor				
		Spring				
		Cleave				
		Ross				
		C. Walker (3)				
		Neri (Mexico)				
1986						
Jan. 12	STS 61–C	R. Gibson (2)	116120	146:04	same	42474:44
		Bolden				
		Hawley (2)				
		G. Nelson (2)				
		Chang-Diaz				
		Cenker				
		B. Nelson				
Jan. 28	STS 51–L	Scobee (2) +	121939	(3)		
		Smith +				
		Resnik (2) +				
		Onizuka (2) +				
		McNair +				
		Jarvis +				
		McAuliffe +				
Feb. 20	Mir	(Occupied by Soyuz T–15, TM2, TM3, TM4, TM5, TM6 and TM7 crews).				
Mar. 13	Soyuz T–15	Kizim (3)	7000	3000:01	same	104374:00
		V. Solovyev (2)				
1987						
Feb. 5	Soyuz TM–2	Romanenko (3)	7070	4179:26	7835:38	116,389:04
		Laveikin			4179:26	
July 22	Soyuz TM–3	Viktorenko	7070	3847:17	191:05	120,618:31
		A. Aleksandrov (2)			3847:17	
		Faris (Syria)			191:05	
Dec. 21	Soyuz TM–4	V. Titov (2)	7070	4320:55	8782:39	138,373:47
		Manarov			8782:39	
		Levchenko			189:58	

TABLE 6–1.—SUMMARY LIST OF PILOTED SPACE FLIGHTS—Continued

Launch date	Vehicle name	Crew (No. of flights)	Weight (kgs)	Ship duration (hr:min)	Crew duration (hr:min)	National Cumulative person-hours (hr:min)
1988						
June 7	Soyuz TM–5	Savinykh (3)	7070	2193:47	236:10	139,082:17
		A. Solovyev				
		A. Aleksandrov (Bulgaria)				
Aug. 29	Soyuz TM–6	Lyakhov (3)	7070	2741:34	212:27	145,289:47
		Polyakov			5782:36	
		Mohmand (Afghanistan)			212:27	
Sept. 29	STS–26	Hauck (3)	115,074	97:00	same	42,959:44
		Covey (2)				
		Lounge (2)				
		Hilmers (2)				
		G. Nelson (2)				
Nov. 26	Soyuz TM–7	A. Volkov (2)	7070	3635:09	3635:09	153,154:12
		Krikalev			3635:09	
		Chretien (2) (France)			594:07	
Dec. 2	STS–27	R. Gibson (3)	N/A	105:06	same	43,485:14
		G. Gardner				
		Mullane (2)				
		Ross (2)				
		W. Shepard				
1989						
Mar. 13	STS–29	Coats (2)		119:39	same	44,083:29
		Blaha				
		Buchli (3)				
		Springer				
		Bagian				
May 4	STS–30	D. Walker (2)		96:57	same	44,568:14
		Grabe (2)				
		Thagard (3)				
		Cleave (2)				
		Lee				

Prepared by CRS.

* Soyuz 4 was launched carrying only Shatalov. Soyuz 5 carried Volynov, Yeliseyev and Khrunov. The latter two transferred to Soyuz 4 via a spacewalk and returned to Earth with Shatalov.

+ Fatality. Four Soviets died in spaceflights: Komarov on Soyuz 1 (1967) when the parachute lines tangled during descent; and the Soyuz 11 crew (1971) when an improperly closed vent allowed the cabin atmosphere to vent into space and the three men (who were not wearing spacesuits) asphyxiated. Seven Americans died in the 1986 space shuttle Challenger tragedy when it exploded 73 seconds after launch; three astronauts died in the 1967 Apollo 204 fire.

[1] Not a space flight, but date of fatal fire on pad during pre-flight test.

[2] Not a spaceflight. Crew jettisoned using emergency abort system after fire erupted in launch vehicle prior to launch.

[3] Exploded 73 seconds after liftoff. All aboard were killed.

TABLE 6–2a.—U.S. PILOTED SPACEFLIGHT CREW MEMBERS BY PROGRAM

Mission	Prime Crew			Backup Crew		
Mercury	**Command Pilot**			**Command Pilot**		
MR–3	A. Shepard			Glenn		
MR–4	Grissom			Glenn		
MA–6	Glenn			Carpenter		
MA–7	Carpenter			Schirra		
MA–8	Schirra			Cooper		
MA–9	Cooper			Shepard		
Gemini	**Command Pilot**	**Pilot**		**Command Pilot**	**Pilot**	
3	Grissom	Young		Schirra	Stafford	
4	McDivitt	White		Borman	Lovell	
~~6~~	Cooper	Conrad		Armstrong	See	
7	Borman	Lovell		White	Collins	
6	Schirra	Stafford		Grissom	Young	
8	Armstrong	Scott		Conrad	Gordon	
9	Stafford	Cernan		Lovell	Aldrin	
10	Young	Collins		Bean	Williams	
11	Conrad	Gordon		Armstrong	Anders	
12	Lovell	Aldrin		Cooper	Cernan	
Apollo	**Commander**	**Command Module Pilot**	**Lunar Module Pilot**	**Commander**	**Command Module Pilot**	**Lunar Module Pilot**
204 [1]	Grissom	White	Chaffee	Schirra	Eisele	Cunningham
7	Schirra	Eisele	Cunningham	Stafford	Young	Cernan
8	Borman	Lovell	Anders	Armstrong	Aldrin	Haise
9	McDivitt	Scott	Schweickart	Conrad	Gordon	Bean
10	Stafford	Young	Cernan	Cooper	Eisele	Mitchell
11	Armstrong	Collins	Aldrin	Lovell	Anders	Haise
12	Conrad	Gordon	Bean	Scott	Worden	Irwin
13	Lovell	Swigert [2]	Haise	Young	Mattingly [2]	Duke
14	A. Shepard	Roosa	Mitchell	Cernan	Evans	Engle
15	Scott	Worden	Irwin	Gordon	Brand	Schmitt
16	Young	Mattingly	Duke	Haise	Roosa	Mitchell
17	Cernan	Evans	Schmitt	Young	Roosa	Duke
Skylab	**Commander**	**Pilot**	**Science Pilot**	**Commander**	**Pilot**	**Science Pilot**
2	Conrad	Weitz	Kerwin	Schweickart	McCandless	Musgrave
3	Bean	Lousma	Garriott	Brand	Lind	Lenoir
4	Carr	Pogue	E. Gibson	Brand	Lind	Lenoir
Apollo-Soyuz	**Commander**	**Command Module Pilot**	**Docking Module Pilot**	**Commander**	**Command Module Pilot**	**Docking Module Pilot**
	Stafford	Brand	Slayton	Bean	Evans	Lousma

TABLE 6–2a.—U.S. PILOTED SPACEFLIGHT CREW MEMBERS BY PROGRAM—Continued

Mission	Prime Crew				Backup Crew
Shuttle[3]	Commander	Pilot	Mission Specialists	Payload Specialist(s)	Backup Payload Specialist(s)
STS–1	Young	Crippen			
STS–2	Engle	Truly			
STS–3	Lousma	Fullerton			
STS–4	Mattingly	Hartsfield			
STS–5	Brand	Overmyer	J. Allen Lenoir		
STS–6	Weitz	Bobko	Musgrave		
STS–7	Crippen	Hauck	Fabian Ride Thagard		
STS–8	Truly	Brandenstein	Bluford D. Gardner W. Thornton		
STS–9	Young	Shaw	Garriott Parker	Lichtenberg Merbold	Lampton Ockels
STS 41–B	Brand	R. Gibson	McCandless McNair Stewart		
STS 41–C	Crippen	Scobee	Hart G. Nelson van Hoften		
STS 41–D	Hartsfield	Coats	Hawley Mullane Resnik	C. Walker	R. Wood
STS 41–G	Crippen	McBride	Sullivan Ride Leestma	Scully-Power Garneau	Thirsk
STS 51–A	Hauck	D. Walker	J. Allen A. Fisher D. Gardner		
STS 51–C	Mattingly	Shriver	Buchli Onizuka	Payton	
STS 51–D	Bobko	D. Williams	Griggs Hoffman Seddon	Garn C. Walker	R. Wood
STS 51–B	Overmyer	Gregory	Lind Thagard W. Thornton	van den Berg Wang	Trinh Johnston
STS 51–G	Brandenstein	Creighton	Fabian Nagel Lucid	Baudry Al-Saud	Chretien Al-Bassam
STS 51–F	Fullerton	Bridges	Henize England Musgrave	Bartoe Acton	Prinz Simon
STS 51–I	Engle	Covey	Lounge W. Fisher van Hoften		
STS 51–J	Bobko	Grabe	Hilmers Stewart	Pailes	
STS 61–A	Hartsfield	Nagel	Buchli Bluford Dunbar	Ockels Furrer Messerschmid	Merbold
STS 61–B	Shaw	O'Connor	Spring Cleave Ross	C. Walker Neri	R. Wood Peralta y Fabi
STS 61–C	R. Gibson	Bolden	Hawley G. Nelson Chang-Diaz	Cenker B. Nelson	Magilton

TABLE 6–2a.—U.S. PILOTED SPACEFLIGHT CREW MEMBERS BY PROGRAM—Continued

Mission	Prime Crew				Backup Crew
Shuttle [3]	Commander	Pilot	Mission Specialists	Payload Specialist(s)	Backup Payload Specialist(s)
STS 51–L [1]	Scobee	Smith	Resnik Onizuka McNair	Jarvis McAuliffe	Butterworth Morgan
STS–26	Hauck	Covey	Lounge Hilmers G. Nelson		
STS–27	R. Gibson	G. Gardner	Mullane Ross W. Shepard		
STS–29	Coats	Blaha	Buchli Springer Bagian		
STS–30	D. Walker	Grabe	Thagard Cleave Lee		

---

[1] Apollo 204 was not a spaceflight, but would have been the first piloted Apollo mission. During testing on the launch pad 24 days before the scheduled launch, a fire erupted in the command module, killing all three of the prime crew astronauts. STS 51–L (***Challenger***) exploded 73 seconds after launch, killing all aboard.

[2] Mattingly was originally assigned to the prime crew but was exposed to measles several days before launch and therefore was replaced by his backup, Swigert, on the actual flight.

[3] In Mar. 1982, NASA announced that it was discontinuing the practice of naming backup crews because there would be an adequate pool of trained astronauts ready to replace a prime crew member based on the large number of shuttle flights planned each year. The exception to this rule is payload specialists and passengers, for whom backups are sometimes named. Initially, NASA announced the first four shuttle crews as: Young and Crippen, Engle and Truly, Haise and Lousma, and Brand and Fullerton. Haise resigned before the flight. Engle and Truly were backups for STS–1, and Mattingly and Hartsfield were backups for STS–2 and STS–3.

TABLE 6–2b.—U.S.S.R. PILOTED SPACEFLIGHT CREW MEMBERS BY PROGRAM [1]

Mission	Prime Crew			Backup Crew		
Vostok	**Command Pilot**	**Pilot**	**Pilot [2]**	**Command Pilot**	**Pilot**	**Pilot [2]**
1	Gagarin			G. Titov		
2	G. Titov			Nikolayev		
3	Nikolayev			Bykovskiy		
				Volynov		
4	Popovich			Komarov		
				Volynov		
5	Bykovskiy			Volynov		
6	Tereshkova			Solovyeva		
				Ponomaryova		
Voskhod	**Command Pilot**	**Pilot**	**Pilot**	**Command Pilot**	**Pilot**	**Pilot**
1	Komarov	Feoktistov (T)	Yegorov (P)	Volynov	Katys	Lazarev
2	Bel'yayev	Leonov		Zaikin	Khrunov	
					Gorbatko	
Soyuz	**Command Pilot**	**Pilot**	**Pilot**	**Command Pilot**	**Pilot**	**Pilot**
1	Komarov			Gagarin		
3	Beregovoy			Shatalov		
				Volynov		
4	Shatalov			Shonin		
5	Volynov	Khrunov (F)	Yeliseyev (T)	Filipchenko	Gorbatko	Kubasov
6	Shonin	Kubasov (F)		Shatalov	Yeliseyev	
7	Filipchenko	V. Volkov (F)	Gorbatko (R)	Shatalov	Yeliseyev	Kolodin
8	Shatalov	Yeliseyev (T)		Nikolayev	Sevast'yanov	
9	Nikolayev	Sevast'yanov (F)		Filipchenko	Grechko	
				Lazarev	Yazdovskiy	
10	Shatalov	Yeliseyev (F)	Rukavishnikov (T)	Leonov	Kubasov	Kolodin
11	Dobrovolskiy	V. Volkov (F)	Patsayev (T)	Leonov	Kubasov	Kolodin
12	Lazarev	Makarov (F)		Gubarev	Grechko	
13	Klimuk	Lebedev (F)		Vorobyov	Yazdovskiy	
14	Popovich	Artyukhin (F)		Sarafanov	Demin	
				Volynov	Zholobov	
				Zudov	Rozhdestvenskiy	
15	Sarafanov	Demin (F)		Volynov	Zholobov	
				Zudov	Rozhdestvenskiy	
16	Filipchenko	Rukavishnikov (F)		Dzhanibekov	Andreyev	
17	Gubarev	Grechko (F)		Lazarev	Makarov	
18A [3]	Lazarev	Makarov (F)		Klimuk	Sevast'yanov	
18	Klimuk	Sevast'yanov		Kovalenok	Ponomaryov	
19 [4]	Leonov	Kubasov (F)		Filipchenko	Rukavishnikov	
				Dzhanibekov	Andreyev	
				Romanenko	Ivanchenkov	
21	Volynov	Zholobov (F)		Zudov	Rozhdestvenskiy	
				Gorbatko	Glazkov	
				Berezovoy	Lisun	
22	Bykovskiy	Aksenov (F)		Malyshev	Strekalov	
				Popov	Andreyev	
23	Zudov	Rozhdestvenskiy (F)		Gorbatko	Glazkov	
				Berezovoy	Lisun	
24	Gorbatko	Glazkov (F)		Berezovoy	Lisun	
				Kozelskiy	Preobrazhenskiy	

TABLE 6-2b.—U.S.S.R. PILOTED SPACEFLIGHT CREW MEMBERS BY PROGRAM [1]—Continued

Mission	Prime Crew			Backup Crew		
Soyuz	**Command Pilot**	**Pilot**	**Pilot**	**Command Pilot**	**Pilot**	**Pilot**
25	Kovalenok	Ryumin (F)		Romanenko	Ivanchenkov	
26	Romanenko	Grechko (F)		Kovalenok	Ivanchenkov	
27	Dzhanibekov	Makarov (F)		Kovalenok	Ivanchenkov	
28	Gubarev	Remek (CR)		Rukavishnikov	Pelcak	
29	Kovalenok	Ivanchenkov (F)		Lyakhov	Ryumin	
30	Klimuk	Hermaszewski (CR)		Kubasov	Jankowski	
31	Bykovskiy	Jahn (CR)		Gorbatko	Kollner	
32	Lyakhov	Ryumin (F)		Popov	Lebedev	
33	Rukavishnikov	Ivanov (CR)		Romanenko	Aleksandrov	
35	Popov	Ryumin (F) [5]		Zudov	Andreyev	
36	Kubasov	Farkas (CR)		Dzhanibekov	Magyari	
T-2	Malyshev	Aksenov (F)		Kizim	Makarov	
37	Gorbatko	Pham Tuan (CR)		Bykovskiy	Bui Thanh Liem	
38	Romanenko	Tamayo Mendez (CR)		Khrunov	Lopez Falcon	
T-3	Kizim	Makarov (F)	Strekalov (R)	Lazarev	Savinykh	Polyakov
T-4	Kovaleno	Savinykh (F)		Zudov	Andreyev	
39	Dzhanibekov	Gurragcha (CR)		Lyakhov	Ganzorig	
40	Popov	Prunariu (CR)		Romanenko	Dediu	
T-5	Berezovoy	Lebedev (F)		V. Titov	Strekalov	
T-6	Dzhanibekov	Ivanchenkov (F)	Chretien (CR)	Kizim	V. Solovyev	Baudry
T-7	Popov	Serebrov (F)	Savitskaya (CR)	Vasyutin	Savinykh	Pronina
T-8	V. Titov	Strekalov (F)	Serebrov (R)	Lyakhov	Savinykh	Aleksandrov
T-9	Lyakhov	Aleksandrov (F)		V. Titov	Strekalov	
T-10A [6]	V. Titov	Strekalov (F)		Kizim	V. Solovyev	
T-10	Kizim	V. Solovyev (F)	Atkov (P)	Vasyutin	Savinyk	Polyakov
T-11	Malyshev	Strekalov (F)	Sharma (CR)	Berezovoy	Grechko	Malhoutra
T-12	Dzhanibekov	Savitskaya (F)	Volk (CR)	Vasyutin	Ivanova	Savinykh
T-13	Dzhanibekov	Savinykh (F)		Popov	Aleksandrov	
T-14	Vasyutin	Grechko (F)	A. Volkov (CR)	Viktorenko	Strekalov	Salei
T-15	Kizim	V. Solovyev (F)		Viktorenko	Aleksandrov	
TM-2	Romanenko	Laveikin (F)		V. Titov	Serebrov	
TM-3	Viktorenko	Aleksandrov (F)	Faris (CR)	A. Solovyev	Savinykh	Habib
TM-4	V. Titov	Manarov (F)	Levchenko (CR)	A. Volkov	Kaleri	Shchukin
TM-5	A. Solovyev	Savinykh (F)	Aleksandrov (CR)	Lyakhov	Serebrov	Stoyanov
TM-6	Lyakhov	Polyakov (P)	Mohmand (CR)	Berezovoy	Arzamazov	Dauran
TM-7	A. Volkov	Krikalev (F)	Chretien (CR)	Viktorenko	Serebrov	Tognini

---

[1] Much of the information on backup crews was provided by Rex Hall based on a Soviet publication.

[2] The second and/or third cosmonauts have not had uniform position titles. In this table, the following abbreviations are used: P=physician/biologist, T=technical scientist, R=research engineer, F=flight engineer, CR=cosmonaut researcher.

[3] Soyuz 18A, or the Apr. 5 Anomaly as it is called by the Soviets, was aborted due to a third stage malfunction in the launch vehicle. Had the mission been successful, it would have been designated Soyuz 18. Instead, the next successful Soyuz mission was given that designation.

[4] Soyuz 19 was the Soviet part of the Apollo-Soyuz Test Project. Per an agreement with the United States, the Soviet Union provided two entire spacecraft, both with prime and backup crews, in the event that the first launch failed. Leonov and Kubasov were the prime crew for the prime spacecraft, with Filipchenko and Rukavishnikov as their backups. Dzhanibekov and Andreyev were the prime crew for the backup spacecraft, with Romanenko and Ivanchenkov as their backups.

[5] Lebedev was the prime crew member, but had to be replaced by Ryumin one month before the launch because of a knee injury.

[6] On Sept. 26, 1983, a Soyuz mission was aborted when the launch vehicle erupted in flames seconds before liftoff. The crew escaped unharmed using the emergency abort tower. If successful, this mission would have been designated Soyuz T-10; instead, the next mission received that number.

TABLE 6–3.—COMPARATIVE DATA ON ASTRONAUT AND COSMONAUT CUMULATIVE TIME IN SPACE

Name	Country	Number of flights	Time (hr:min)
Romanenko	U.S.S.R	3	10338:21 (431 days)
Kizim	U.S.S.R	3	8993:59
Titov, V.	U.S.S.R	2	8830:57
Manarov	U.S.S.R	1	8782:39
Solovyev, V.	U.S.S.R	2	8686:51
Ryumin	U.S.S.R	3	8685:33
Lyakhov	U.S.S.R	3	7998:49
Aleksandrov	U.S.S.R	2	7433:03
Savinykh	U.S.S.R	3	6066:39
Polyakov	U.S.S.R	1	5782:36
Atkov	U.S.S.R	1	5686:50
Lebedev	U.S.S.R	2	5262:01
Kovalenok	U.S.S.R	3	5194:11
Volkov, A.	U.S.S.R	2	5193:01
Berezovoy	U.S.S.R	1	5073:05
Popov	U.S.S.R	3	4814:45
Laveikin	U.S.S.R	1	4179:26
Krikalev	U.S.S.R	1	3635:09
Ivanchenkov	U.S.S.R	2	3540:39
Dzhanibekov	U.S.S.R	5	3495:59
Grechko	U.S.S.R	3	3236:33
Carr	U.S	1	2017:16 (84 days)
Gibson, E.	U.S	1	2017:16
Pogue	U.S	1	2017:16
Sevast'yanov	U.S.S.R	2	1936:19
Klimuk	U.S.S.R	3	1890:19
Garriott	U.S	2	1674:56
Bean	U.S	2	1671:45
Lousma	U.S	2	1619:14
Vasyutin	U.S.S.R	1	1557:52
Volynov	U.S.S.R	2	1255:17
Zholobov	U.S.S.R	1	1182:23
Conrad	U.S	4	1179:38
Gubarev	U.S.S.R	2	899:36
Young	U.S	6	835:42
Weitz	U.S	2	793:14
Chretien	U.S.S.R./France	2	783:58
Gorbatko	U.S.S.R	3	732:48
Lovell	U.S	4	715:06
Volkov, V.	U.S.S.R	2	689:02
Kerwin	U.S	1	672:50
Dobrovolskiy	U.S.S.R	1	570:22
Patsayev	U.S.S.R	1	570:22
Cernan	U.S	3	566:16
Crippen	U.S	4	565:49
Scott	U.S	3	546:54
Strekalov	U.S.S.R	3	545:07
Brand	U.S	3	530:58
Nikolayev	U.S.S.R	2	519:21
Mattingly	U.S	3	508:35
Stafford	U.S	4	507:43
Bykovskiy	U.S.S.R	3	497:47
Makarov	U.S.S.R	4	497:43
Hartsfield	U.S	3	482:52
Walker, C.	U.S	3	477:57
Borman	U.S	2	477:36
Savitskaya	U.S.S.R	2	473:06
Kubasov	U.S.S.R	3	450:00
Popovich	U.S.S.R	2	448:27
Gibson, R.	U.S	3	442:26
Hauck	U.S	3	435:09
Glazkov	U.S.S.R	1	425:26

TABLE 6–3.—COMPARATIVE DATA ON ASTRONAUT AND COSMONAUT CUMULATIVE TIME IN SPACE—Continued

Name	Country	Number of flights	Time (hr:min)
Shaw	U.S	2	412:52
Thagard	U.S	3	411:30
Nelson, G.	U.S	3	410:44
Bobko	U.S	3	386:06
Fullerton	U.S	2	382:50
Artyukhin	U.S.S.R	1	377:30
Buchli	U.S	3	361:56
Ride	U.S	2	343:48
McDivitt	U.S	2	338:57
Nagel	U.S	2	338:23
van Hoften	U.S	2	337:58
Gardner, D.	U.S	2	336:54
Fabian	U.S	2	316:03
Gordon	U.S	2	315:53
Brandenstein	U.S	2	314:48
Allen, J.	U.S	2	313:59
Bluford	U.S	2	313:53
Thornton, W.	U.S	2	313:18
Musgrave	U.S	2	311:09
Evans	U.S	1	301:52
Schmitt	U.S	1	301:52
Schirra	U.S	3	295:13
Irwin	U.S	1	295:12
Worden	U.S	1	295:12
Hawley	U.S	2	291:01
Overmyer	U.S	2	290:23
Aldrin	U.S	2	289:54
Stewart	U.S	2	289:03
Walker, D.	U.S	2	288:42
Aksenov	U.S.S.R	2	284:11
Malyshev	U.S.S.R	2	284:00
Volk	U.S.S.R	1	283:14
Ross	U.S	2	270:11
Covey	U.S	2	267:18
Lounge	U.S	2	267:18
Collins	U.S	2	266:06
Duke	U.S	1	265:51
Coats	U.S	2	264:36
Cleave	U.S	2	262:02
Filipchenko	U.S.S.R	2	261:04
Eisele	U.S	1	260:09
Cunningham	U.S	1	260:09
Mullane	U.S	2	250:03
Lichtenberg	U.S	1	247:47
Merbold	U.S./ESA	1	247:47
Parker	U.S	1	247:47
Schweickart	U.S	1	241:01
Serebrov	U.S.S.R	2	238:10
Shatalov	U.S.S.R	3	237:58
Rukavishnikov	U.S.S.R	3	237:11
Solovyev, A.	U.S.S.R	1	236:10
Aleksandrov, A.	U.S.S.R./Bulgaria	1	236:10
Cooper	U.S	2	225:15
Engle	U.S	2	224:31
Slayton	U.S	1	217:28
Shepard, A.	U.S	2	216:17
Mitchell	U.S	1	216:02
Roosa	U.S	1	216:02
Yeliseyev	U.S.S.R	3	214:26
Mohmand	U.S.S.R./Afghanistan	1	212:27

TABLE 6-3.—COMPARATIVE DATA ON ASTRONAUT AND COSMONAUT CUMULATIVE TIME IN SPACE—Continued

Name	Country	Number of flights	Time (hr:min)
Armstrong	U.S	2	206:00
Truly	U.S	2	199:22
Garneau	U.S./Canada	1	197:24
Leestma	U.S	1	197:24
McBride	U.S	1	197:24
Scully-Power	U.S	1	197:24
Sullivan	U.S	1	197:24
Hilmers	U.S	2	194:47
Grabe	U.S	2	194:44
Fisher, A.	U.S	1	191:45
McCandless	U.S	1	191:16
McNair	U.S	1	191:16
Faris	U.S.S.R./Syria	1	191:05
Viktorenko	U.S.S.R	1	191:05
Acton	U.S	1	190:45
Bartoe	U.S	1	190:45
Bridges	U.S	1	190:45
England	U.S	1	190:45
Henize	U.S	1	190:45
Remek	U.S.S.R./Czech	1	190:16
Hermaszewski	U.S.S.R./Poland	1	190:03
Levchenko	U.S.S.R	1	189:58
Sharma	U.S.S.R./India	1	189:41
Jahn	U.S.S.R./GDR	1	188:49
Farkas	U.S.S.R./Hungary	1	188:46
Gurragcha	U.S.S.R./Mongolia	1	188:43
Tamayo Mendez	U.S.S.R./Cuba	1	188:43
Pham Tuan	U.S.S.R./Vietnam	1	188:42
Prunariu	U.S.S.R./Romania	1	188:41
Fisher, W.	U.S	1	170:18
Al-Saud	U.S./Saudi Arabia	1	169:39
Baudry	U.S./France	1	169:39
Creighton	U.S	1	169:39
Lucid	U.S	1	169:39
Dunbar	U.S	1	168:44
Furrer	U.S./FRG	1	168:44
Messerschmid	U.S./FRG	1	168:44
Ockels	U.S./ESA	1	168:44
Leonov	U.S.S.R	2	168:33
Gregory	U.S	1	168:09
Lind	U.S	1	168:09
van den Berg	U.S	1	168:09
Wang	U.S	1	168:09
Garn	U.S	1	167:55
Griggs	U.S	1	167:55
Hoffman	U.S	1	167:55
Seddon	U.S	1	167:55
Williams, D.	U.S	1	167:55
Hart	U.S	1	167:40
Scobee	U.S	1	167:40
Neri Vela	U.S./Mexico	1	165:05
O'Connor	U.S	1	165:05
Spring	U.S	1	165:05
Anders	U.S	1	147:01
Bolden	U.S	1	146:04
Cenker	U.S	1	146:04
Chang-Diaz	U.S	1	146:04
Nelson, B.	U.S	1	146:04
Resnik	U.S	1	144:57
Haise	U.S	1	142:55

TABLE 6-3.—COMPARATIVE DATA ON ASTRONAUT AND COSMONAUT CUMULATIVE TIME IN SPACE—Continued

Name	Country	Number of flights	Time (hr:min)
Swigert	U.S	1	142:55
Lenoir	U.S	1	122:14
Peterson	U.S	1	120:24
Bagian	U.S	1	119:39
Blaha	U.S	1	119:39
Springer	U.S	1	119:39
Shonin	U.S.S.R	1	118:43
Gardner, G.	U.S	1	105:06
Shepard, W.	U.S	1	105:06
White	U.S	1	97:56
Pailes	U.S	1	97:47
Lee	U.S	1	96:57
Beregovoy	U.S.S.R	1	94:51
Onizuka	U.S	1	73:33
Payton	U.S	1	73:33
Shriver	U.S	1	73:33
Tereshkova	U.S.S.R	1	70:50
Komarov	U.S.S.R	2	51:05
Demin	U.S.S.R	1	48:12
Sarafanov	U.S.S.R	1	48:12
Rozhdestvenskiy	U.S.S.R	1	48:07
Zudov	U.S.S.R	1	48:07
Khrunov	U.S.S.R	1	47:49
Lazarev	U.S.S.R	2	47:36
Ivanov	U.S.S.R./Bulgaria	1	47:01
Bel'yayev	U.S.S.R	1	26:02
Titov, G.	U.S.S.R	1	25:18
Yegorov	U.S.S.R	1	24:17
Feoktistov	U.S.S.R	1	24:17
Grissom	U.S	2	5:09
Carpenter	U.S	1	4:56
Glenn	U.S	1	4:55
Gagarin	U.S.S.R	1	1:48

TOTALS

U.S./NASA	114	
U.S./non-NASA	12	
U.S./foreign	8	
U.S. total [1]	134 people	44,568:14 (5.1 YRS)
U.S.S.R	67	
U.S.S.R./foreign	14	
U.S.S.R. total [2]	81 people	153,154:12 (17.5 YRS)
World total	215 people	197,722:26 (22.6 YRS)

---

[1] 1 person flew in space 6 times; 4 people 4 times; 13 people 3 times; 39 people 2 times; and 77 people 1 time.

[2] 1 person flew in space 5 times; 1 person 4 times; 16 people 3 times; 21 people 2 times; and 42 people 1 time.

TABLE 6–4.—COMPARATIVE TIME SPENT ON EXTRAVEHICULAR ACTIVITY

Name	Country	Number of EVAs (mission)		Total (hrs:min)
		Space	Lunar	
Kizim	U.S.S.R.	6 (Soyuz T–10) 2 (Soyuz T–15)	0	31:40
Solovyev, V.	U.S.S.R.	6 (Soyuz T–10) 2 (Soyuz T–15)	0	31:40
Cernan	U.S.	1 (Gemini 9)	3 (Apollo 17)	24:11
Schmitt	U.S.	1 (Apollo 17)	3 (Apollo 17)	23:10
van Hoften	U.S.	1 (STS 41–C) 2 (STS 51–I)	0	22:08
Duke	U.S.	1 (Apollo 16)	3 (Apollo 16)	21:38
Young	U.S.	0	3 (Apollo 16)	20:14
Scott	U.S.	1 (Apollo 9)	4 (Apollo 15) [1]	20:09
Irwin	U.S.	1 (Apollo 15)	3 (Apollo 15)	19:13
Carr	U.S.	3 (Skylab 4)	0	15:51
Gibson, E.	U.S.	3 (Skylab 4)	0	15:22
Garriott	U.S.	3 (Skylab 3)	0	13:42
Manarov	U.S.S.R.	3 (Soyuz TM 4/6)	0	13:37
Titov, V.	U.S.S.R.	3 (Soyuz TM 4/6)	0	13:37
Pogue	U.S.	2 (Skylab 4)	0	13:37
Conrad	U.S.	2 (Skylab 2)	2 (Apollo 12)	12:45
Ross	U.S.	2 (STS 61–B)	0	12:12
Spring	U.S.	2 (STS 61–B)	0	12:12
Fisher, W.	U.S.	2 (STS 51–I)	0	11:38
Stewart	U.S.	2 (STS 41–B)	0	11:30
McNair	U.S.	2 (STS 41–B)	0	11:30
Lousma	U.S.	2 (Skylab 3)	0	11:01
Allen, J.	U.S.	2 (STS 51–A)	0	10:43
Gardner, D.	U.S.	2 (STS 51–A)	0	10:43
Nelson, G.	U.S.	1 (STS 41–C)	0	10:30
Bean	U.S.	1 (Skylab 3)	2 (Apollo 12)	10:27
Romanenko	U.S.S.R.	1 (Soyuz 26) [1] 3 (Soyuz TM 2/3)	0	10:16
Mitchell	U.S.	0	2 (Apollo 14)	9:23
Shepard, A.	U.S.	0	2 (Apollo 14)	9:23
Laveikin	U.S.S.R.	3 (Soyuz TM–2/3)	0	8:48
Dzhanibekov	U.S.S.R.	1 (Soyuz T–12) 1 (Soyuz T–13)	0	8:35
Aldrin	U.S.	3 (Gemini 12)	1 (Apollo 11)	8:18
Lyakhov	U.S.S.R.	1 (Soyuz 32/34) 2 (Soyuz T–9)	0	7:08
Volkov, A.	U.S.S.R.	1 (Soyuz TM–7)	0	6:00
Chretien	France [2]	1 (Soyuz TM–7)	0	6:00
Aleksandrov, A.	U.S.S.R.	2 (Soyuz T–9)	0	5:45
Savinykh	U.S.S.R.	1 (Soyuz T–13/14)	0	5:00
Musgrave	U.S.	1 (STS–6)	0	3:52
Peterson	U.S.	1 (STS–6)	0	3:52
Savitskaya	U.S.S.R.	1 (Soyuz T–12)	0	3:35
Leestma	U.S.	1 (STS 41–G)	0	3:30
Sullivan	U.S.	1 (STS 41–G)	0	3:30
Kerwin	U.S.	1 (Skylab 2)	0	3:23
Griggs	U.S.	1 (STS 51–C)	0	3:00
Hoffman	U.S.	1 (STS 51–C)	0	3:00
Armstrong	U.S.	0	1 (Apollo 11)	2:48
Gordon	U.S.	2 (Gemini 11)	0	2:41
Berezovoy	U.S.S.R.	1 (Soyuz T–5)	0	2:33
Lebedev	U.S.S.R.	1 (Soyuz T–5)	0	2:33
Weitz	U.S.	2 (Skylab 2)	0	2:11
Ivanchenkov	U.S.S.R.	1 (Soyuz 29)	0	2:05
Kovalenok	U.S.S.R.	1 (Soyuz 29)	0	2:05
Grechko	U.S.S.R.	1 (Soyuz 26)	0	1:28
Collins	U.S.	2 (Gemini 10)	0	1:27
Mattingly	U.S.	1 (Apollo 16)	0	1:24

TABLE 6–4.—COMPARATIVE TIME SPENT ON EXTRAVEHICULAR ACTIVITY—Continued

Name	Country	Number of EVAs (mission)		Total (hrs:min)
		Space	Lunar	
Ryumin	U.S.S.R.	1 (Soyuz 29)	0	1:23
Schweickart	U.S.	1 (Apollo 9)	0	1:07
Evans	U.S.	1 (Apollo 17)	0	1:06
Khrunov	U.S.S.R.	1 (Soyuz 4/5)	0	1:00
Yeliseyev	U.S.S.R.	1 (Soyuz 4/5)	0	1:00
Worden	U.S.	1 (Apollo 15)	0	:38
White	U.S.	1 (Gemini 4)	0	:36
Leonov	U.S.S.R.	1 (Voskhod 2)	0	:24
Subtotal:				
41 people	U.S.	60	29	399:35
21 people	U.S.S.R.	48	0	160:12
1 person	France [2]	1	0	6:00
Total:				
63 people		109	29	565:47

Note: It is quite difficult to establish accurate figures for EVA (extravehicular activity) time. For Gemini, times were calculated from hatch opening to hatch closing; for Apollo and Skylab, times were based on cabin pressure equalling 3.0 psi. The times given here for Voskhod 2 and Soyuz 4/5 are thought to be equivalent to "hatch opening to hatch closing." Leonov reportedly spent 12 minutes outside the spacecraft, while Khrunov and Yeliseyev are thought to have spent 15 minutes transferring from Soyez 5 to Soyuz 4. On Soyuz 26, Grechko was reported by the Soviets to have spent 20 minutes outside the spacecraft, and 1 hour 28 minutes in the "near vacuum conditions of space" which is taken here to mean hatch opening to hatch closing.

[1] Scott performed a stand-up EVA from the lunar module during Apollo 15. Romanenko performed a stand-up EVA during Soyuz 26.

[2] Chretien make his spacewalk during a Soviet/French mission to the Soviet Mir space station. He is the only non-American, non-Russian to have made a spacewalk to date.

TABLE 6-5.—DECEASED ASTRONAUTS AND COSMONAUTS

Name	Country/program	Date	Cause of death
Adams	U.S./MOL; X-15	11/15/67	X-15 crash
Bassett	U.S./NASA	02/28/66	Jet crash
Bel'yayev	U.S.S.R.	01/10/70	Complications from surgery
Chaffee	U.S./NASA	01/27/67	Apollo 204
Dobrovolskiy	U.S.S.R.	06/29/71	Soyuz 11
Eisele	U.S./NASA	12/02/87	Heart attack
Freeman	U.S./NASA	10/31/64	Jet crash
Gagarin	U.S.S.R.	03/27/68	Jet crash
Givens	U.S./NASA	06/06/67	Automobile accident
Griggs	U.S./NASA	06/17/89	Airplane crash
Grissom	U.S./NASA	01/27/67	Apollo 204
Jarvis	U.S./NASA*	01/28/86	Challenger
Komarov	U.S.S.R.	04/24/67	Soyuz 1
Lawrence	U.S./MOL	12/08/67	Jet crash
Levchenko	U.S.S.R.	08/06/88	Brain tumor
McAuliffe	U.S./NASA*	01/28/86	Challenger
McNair	U.S./NASA	01/28/86	Challenger
McKay	U.S./X-15	04/27/75	Complications from 1962 X-15 crash
Onizuka	U.S./NASA	01/28/86	Challenger
Patsayev	U.S.S.R.	06/29/71	Soyuz 11
Resnik	U.S./NASA	01/28/86	Challenger
Rogers	U.S./X-20	09/13/67	F-105 explosion
See	U.S./NASA	02/28/66	Jet crash
Scobee	U.S./NASA	01/28/86	Challenger
Shchukin	U.S.S.R.	08/13/88	Airplane crash
Smith	U.S./NASA	01/28/86	Challenger
Swigert	U.S./NASA	12/27/82	Cancer
Taylor	U.S./MOL	09/04/70	Jet crash
Thorne	U.S./NASA	05/24/86	Airplane crash
Volkov, V.	U.S.S.R.	06/29/71	Soyuz 11
Walker	U.S./X-15	06/08/66	Jet crash
White	U.S./NASA	01/27/67	Apollo 204
Williams, C.	U.S./NASA	10/05/67	Jet crash

Note: Names in italics indicate individuals who had left their respective space program before their death.

* Jarvis and McAuliffe were not NASA astronauts, but were payload specialists aboard NASA's space shuttle ***Challenger.***